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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR and Eastern Europe. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to the United States Government research.

SCIENTIFIC INFORMATION REPORT

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1. Radio Echoes From Meteors

"The Distribution of Radio Echoes According to Duration. I. Reflections From Stable Trails," by Ye. I. Fialko, Tomsk Polytechnic Institute; Moscow, Astronomicheskiy Zhurnal, Vol 36, No 5, Sep/Oct 59, pp 867-873

The distribution of radio echoes received from a sector according to the duration of reflection is considered. An analytical expression is given for general and two particular cases. Experiments, on the whole, confirm the derived results.

2. Radio Detection of Atomic Hydrogen

"The Possibility of Detection of Resolved Lines of Atomic Hydrogen in Radio Range," by N. S. Kardashev, State Astronomical Institute imeni Shternberg; Moscow, Astronomicheskiy Zhurnal, Vol 36, No 5, Sep/Oct 59, pp 838-844

The emission of hydrogen lines due to transitions between levels with large quantum numbers n is considered. It is shown that transitions of the type $n \to n - 1$ are most probable. The oscillator strength of such transitions is $f = \frac{n}{2}$, which is many orders higher than the oscillator strength for transitions between components of fine and superfine structure. The estimate of intensity shows that the lines can be observed in the far infrared up to the decimeter range of radio waves.

3. Exploration of the Moon

"Rocks Most Similar to Those Composing the Lunar Surface," by N. P. Barabashev and A. T. Chekirada, Kharkov Astronomical Observatory; Moscow, Astronomicheskiy Zhurnal, Vol 36, No 5, Sep/Oct 59, pp 851-855

On the basis of the photometric and spectrophotometric observations made by the authors of the Moon and rocks of the earth, and also on the basis of other characteristics, it is shown that disrupted volcanic tuffs correspond best to the material of the lunar surface. For the identifications, a considerable number of characteristics was used and not two or three as has been done until now.

The comparison was made according to: (1) brightness for integral light, (2) reflection coefficients for different regions of the spectrum, (3) law of reflection of light, (4) smoothness factor, (5) energy distribution in the spectrum, (6) curves giving the variation of the degree of polarization in dependence on the angles of incidence and reflection of light and also the phase angles, (7) thermal conductivity, and (8) density. Besides, the characteristics of lunar objects were also compared with earth rocks, the surface of which was: (1) irradiated by ultraviolet rays, (2) X-rays, (3) protons in vacuum, (4) fused at atmospheric pressure, (5) fused in vacuum, and (6) broken up into grains of various size and striated before and after fusion.

As a result of all these comparisons, it was found that the lunar surface does not resemble a fused surface. It is most probable that it is covered by disrupted tuff-like rocks and in some places by large-grain volcanic ash.

4. Solar Corona

"The Structure of the Far Outer Corona of 19 June, 1936," by V. A. Bronshten, Moscow Planetarium; Moscow, Astronomicheskiy Zhurnal, Vol 36, No 5, Sep/Oct 59, pp 845-850

The structure of the far outer corona (at a distance of more than one solar diameter from the Moon's limb) was studied using photographs obtained during the solar eclipse of 19 June, 1936 by the expeditions of the Moscow Branch of the Astronomical-Geodetical Society and the Kiev University Observatory. The plates were taken with an Astrotzval camera (f = 96 cm) and a Cook astrograph (f = 175 cm), using long exposures and light filters, weakening the scattered sky light. The coronal rays on the photographs extend to 5-8 $R_\odot$. A description of the coronal rays and their helmets is given and their connection with photospheric and chromospheric formations considered. An attempt was made to elucidate the arrangement of the rays in space, Lyot's noneclipse observations also being used for this purpose.

Prominences and dark filaments are at the base of all the long straight rays. Usually the rays run exactly out of the prominences and are inclined from the radius-vector toward the solar equator. If in the vicinity there are intense flocculi surrounding sunspots, the bases of the rays are displaced towards the flocculi but the rays themselves are inclined towards the pole. A curved ray, similar to a thin parabolic stream, has been noted on the photographs. A comparison has been made of the obtained results with those of radio observations of nonuniformities in the corona. The determined breadth of the rays (10^5 km) at a distance of 4 $R_\odot$ from the Moon's limb is in good agreement with the radio astronomical estimates made by Howish and Vitkevich.

5. Solar Corpuscular Streams

"The Main Source of Solar Corpuscular Streams," by Ye. R. Mustel, Astronomical Council, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 2, Sep 59, pp 265-268

It was found that corpuscular solar streams producing geomagnetic disturbances and affecting short-wave radio communications are particularly active before the minimum cycle of solar activity, though they are also frequent during the periods of maximum solar activity. It has been inferred that flocculi passing near the solar equator are particularly responsible for radial corpuscular emission causing geomagnetic disturbances.

II. CHEMISTRY

Crystal Chemistry

6. Crystal Chemistry of Semiconductors

"Phases of Variable Composition in the Crystal Chemistry of Semiconductors," by B. F. Ormont, Physicochemical Institute imeni L. Ya. Karpov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 10, Oct 59, pp 2295-2303

The phases and compounds of variable composition are discussed with particular attention to semiconductor systems and phases. It is proposed that for the purpose of crystal-chemical investigation of semiconductors all substances studied be subdivided into three classes: (A) those which 10^{12} - 10^{8} picogram atoms of impurity per 1 gram atom, i.e., 10^{-2} - 10-2 atomic percent of impurity (1 picogram-atom = 10^{-12} gram-atoms = 6.023 X 10^{11} atoms); (B) 10^{4} - 10^{8} picogram-atoms of impurity per gram-atom, i.e., from 10^{-6} - 10^{-2} atomic percent of impurity; and (C) 10^{-4} - 1 picogram-atoms of impurity per gram-atom, i.e., 10^{-10} -10^{-6} atomic percent of impurity. Substances of Class A can be investigated by the customary methods of analytical chemistry and precision X-ray diffraction analysis. In the investigation of substances of Class B, one is limited to the determination of impurities and the content of the principal component must be determined by deducting the amount of impurities. In the analysis of substances of this class different methods of analysis involving both chemical procedures (but with the application of tracer atoms, etc.) and physical methods must be resorted to. Investigations of substances of Class C requires the application of electrophysical, radioactivation, and other methods, which in many cases must be expressly developed for this purpose.

The most convenient way of treating constitutional diagrams of semiconductors is considered. On the basis of a consideration of typical constitutional diagrams, the conclusion is reached that there are no semiconductor phases of constant composition: semiconductors always consist of phases of variable composition.

It is pointed out that hitherto crystal-chemical investigations were carried out principally on substances of Class A. In connection with the development of semiconductor electronics, it is necessary to expand investigation of substances of Class A from a different theoretical standpoint and also do fundamentally new research on substances of Classes B and C. Some of the most important problems of semiconductor crystal chemistry, as far as substances of Class A are concerned, are those pertaining to the effect of the far order on the properties of semiconductors, the effect of the quantum characteristics of substituent elements on the

properties of solid solutions constituting phases of variable composition, and the effect of different actual structures of crystals (within the limits of the same composition and geometric structure) on the properties of semiconductors. It is brought out that reproducibility of the characteristics of semiconductors could not be achieved hitherto because research on structures was detached from thermodynamic investigations. To eliminate this shortcoming, a number of investigations was carried out at the Physicochemical Institute imeni L. Ya. Karpov on heterogeneous equilibria at temperatures up to 3,000° K and higher. The results of the research in question were correlated with results obtained on the investigation of structure and of the characteristics of phases. This approach is of particular importance as far as investigation of substances of Classes B and C is concerned.

According to the author, the importance of establishing correlations between thermodynamic, electrophysical, and mechanical properties of semiconductors is illustrated by several papers which he has published and which are listed in the bibliography appended to this article.

Electrochemistry

7. An Electrolytic Method of Working Dies for Wire Drawing

"Electrolytic Working of Cermet Dies" by N. B. Sokolov and A. I. Levin, Ural Polytechnic Institute imeni S. M. Kirov; Leningrad, Zhurnal Prikladnoy Khimii, Vol 32, No 8, Aug 59, pp 1774-1781

On the basis of a consideration of the process of anodic dissolution of cermet alloys of the VK6 type consisting of tungsten carbide and cobalt, the most favorable conditions are discussed under which the contour of the cathode will be duplicated in the most precise manner on the anode. The advantages of the electrolytic working of cermet dies as compared with the mechanical grinding and polishing of such dies with abrasives are brought out. Experimental data are given which indicate that it is possible to obtain by this method an orifice of very complicated configuration with the precise measurements desired. Various methods of circulating the electrolyte (by rotating the cathode which is located within the orifice of the die forming the anode or by maintaining gravity flow inside or outside of the orifice) are considered. The advantages of a new system of circulation are set forth whereby the electrolyte is drawn through the orifice of the die by suction produced by a vacuum pump.

8. Shock Waves In Monoatomic Gases and Hydrogen

"Equilibrium Parameters of Powerful Shock Waves In Monatomic Gases and Hydrogen," by S. R. Kholev, Moscow State University; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy - Fizika, No 4, Jul 59, pp 28-37

By using shock tubes or pulse discharges, one can generate under laboratory conditions powerful shock waves in which thermal ionization exerts a significant effect on the characteristics of the gas behind the wave front. Calculation of gas parameters under the assumption that thermodynamic equilibrium exists and that losses by radiation are small is the first essential step in determining the state of the gas. Subsequent stages must include evaluation of radiation losses, which makes the calculation less generally applicable, because the characteristics of the radiation and the configuration of flow must be taken into consideration. If the degree of ionization is very high, it may be desirable to estimate the effect of the interaction between charged particles on the thermodynamic characteristics of the gas.

A method has been developed for calculation of the characteristics of a gas behind a shock wave under consideration of the ionization and of the excitation of atoms. Results are given of calculations for xenon, hydrogen, deuterium, and tritium.

9. Fluorinated Hydrocarbon Lubricants and Liquids Resistant to Action of Oxidizers

"The Properties of Fluorinated Hydrocarbon Lubricants and Liquids Resistant to the Action of Oxidizers," by T. N. Nikolayeva and Ye. P. Krychko; Moscow, Khimicheskaya Promyshlennost, No 5, Jul/Aug 59, pp 388-390

It is pointed out that in connection with new technical problems which have arisen, the necessity developed of using lubricants which are resistant to the action of strong oxidants. Lubricants consisting of fluorinated hydrocarbons and fluorinated hydrocarbons containing chlorine were found to be suitable for this purpose. US developments in the synthesis and production of such lubricants and lubricating greases based on fluorohydrocarbons are reviewed. It is stated that fluorinated liquid compounds are also used extensively in pressure gauges for oxidants (e.g., nitrous gases) and as sealing liquids which have to withstand the action of strongly oxidizing agents.

During recent years, a number of oils and lubricating greases of this type and also sealing liquids based on fluorohydrocarbons, specifically fluorochloroethylene, fluoroparaffins, and fluorinated petroleum oils have been developed in the USSR. The properties of Soviet fluorohydrocarbon lubricants and sealing liquids are listed. It is stated that one of the shortcomings of products of this type is the fact that their viscosity undergoes considerable changes with the temperature. Graphs which illustrate this are included in the source.

Data on the solubilities of Soviet fluorohydrocarbon lubricants in carbon tetrachloride, acetone, dichloroethane, and xylene are given. A table lists data on the stability of these fluorohydrocarbon lubricants and of Soviet fluorohydrocarbon sealing liquids to the action of fuming nitric acid, concentrated perchloric acid, concentrated hydrochloric acid, concentrated sulfuric acid, hydrogen peroxide [concentration not given], and hydrogen fluoride (liquid and gaseous). It is pointed out that fluorohydrocarbons, although resistant to the action of strong oxidizing agents, have a very low resistance to the action of ammonia and amines. Experiments demonstrating this are described.

10. Explosiveness of Dinitrobenzenes

"The Danger of Explosion Presented by Dinitro Derivatives of Benzene," by I. F.Blinov (deceased); Moscow, Khimicheskaya Promyshlennost, No 5, Jul/Aug 59, pp 419-425

It was established in the experiments described that dinitrophenol, dinitrobenzene, dinitrochlorobenzene, dinitrotoluene, and dinitroaniline have a rather low sensitivity to mechanical and thermal effects such as those produced by impact, friction, the action of a bullet, heating, and the action of a flame. On the other hand, picramic acid exhibits a high sensitivity to impact, heating, and particularly to the action of flames. However, its explosion because of the action of an impact, shock, friction, heat, or fire is rather improbable under normal conditions of storage.

Among the dinitrocompounds which have been investigated, only dinitrobenzene, dinitrophenol, and dinitrochlorobenzene may detonate because the critical diameter has been exceeded. This finding was made under conditions which exist when these compounds are contained in paper cases, paper cartridges, or covers consisting of material with similar properties, the density of packing is low, and the content of moisture is lower than 1 percent. To set off dinitrotoluene, picramic acid, or dinitroaniline, an intermediate initiating charge consisting of a high explosive is necessary. A thin-walled glass or metal shell increases to a considerable extent the explosiveness of dinitrocompounds. Density of packing has a strong effect on the capacity of dinitrocompounds to explode: the relation between the explosiveness and density is the same as for some mixtures constituting explosives in the proper sense of the word. The dependence of the explosiveness of dinitrocompounds on their water content has been determined.

It was established that the dinitrocompounds investigated have a higher explosiveness than ammonium nitrate. According to their explosiveness measured on the basis of the minimum diameter at which detonation is sustained when the density of packing is lower than 1 g/cm^3 and the dinitrocompounds are packed in cardboard containers, the compounds investigated can be arranged in the following order, starting with the most explosive compound: dinitrobenzene, dinitrophenol, dinitrochlorobenzene (crystalline), dinitrotoluene, picramic acid, and dinitroaniline. On the basis of the explosive power determined by the Trauzl lead block test, they fall into the following sequence, starting with the most effective compound: dinitrobenzene, dinitrotoluene, dinitrophenol, dinitrochlorobenzene, picramic acid, dinitroaniline. The greatest differences in the explosiveness of the dinitrocompounds investigated were observed in experiments with charges placed in paper containers. When thin-walled metal tubes of a small diameter (approximately 15 millimeters) were used as containers, the differences in the explosiveness were found to be smaller.

Growth Stimulators

11. Soviet Research on Growth Stimulators Cited

"Growth Stimulators", (unsigned article); Moscow, Izvestiya, 18 Nov 59, p 3

Soviet biologists and chemists have discovered a great many substances which exhibit high physiological activity. Even in insignificantly small amounts they have a very strong effect on plants. By using them on plants one can either intensify or delay or, if necessary, shorten the growing process.

Broad research is being conducted on the action of chemical substances on plant metabolism at the Institute of Plant Physiology of the Academy of Sciences USSR. Prof Yu. V. Rakitin is head of this institute. Many practical methods have been developed for the control of plant life processes. Among the most important are those concerning: the germination of potato tubers from dormancy; increasing the yield of tomatoes and accelerating their ripening; and decreasing the preharvest fall of apples, pears, and other fruits.

Tremendous economic importance is attached to the methods proposed by scientists which would permit the storage of potatoes and other vegetables for long periods without spoilage. A preparation, labeled M-1, when sprinkled on potato tubers prevents sprouting and maintains a high-quality product during storage. Preparations have been developed to prevent the sprouting of sugar beets and onions during prolonged storage.

12. Some Papers in the Field of Applied Chemistry Presented at the Eighth Mendeleyev Congress

"The Eighth Mendeleyev Congress of General and Applied Chemistry," by L. K. Simonova and M. I. Kurochkina; Leningrad, Zhurnal Prikladnoy Khimii, Vol 32, No 10, Oct 59, pp 2129-2138

Papers presented at the Eighth Mendeleyev Congress of General and Applied Chemistry (Moscow, 16-23 March 1959) and of particular interest to readers of Zhurnal Prikladnoy Khimii are reviewed. The abstracts of some of these paper follow.

At meetings of the Section of Inorganic Chemistry and Technology, more than one hundred reports in different fields of chemistry were presented. Papers dealing with the investigation of peroxides and compounds of the peroxide type aroused considerable interest.

I. A. Kazarnovskiy (Moscow) reported on the mechanism of the reactions leading to the formation of peroxides and the oxidation effect produced by compounds of this class. He investigated the mechanism of the oxidation of barium oxide to barium peroxide. Using the magnetic method, the reaction of the spontaneous decomposition of the solid perhydrate [peroxyhydrate] $K_2O_2 \cdot 2H_2O_2$ was investigated. Furthermore, the reaction between potassium ozonide and heavy water was investigated. It was established that in all three classes of peroxy compounds mentioned, free hydroxyl radicals function as carriers of the oxidative effect. The great differences in the intensity of this effect are due principally to the different concentrations of hydroxyl radicals. In the case of ozonides, this concentration is by several orders higher than in the case of the Fenton reagent.

S. G. Makarov (Moscow) investigated the perhydrate forms of peroxides of metals of the I and II groups of the periodic system. The results obtained confirm the conclusion that perhydrates of the peroxides formed by elements belonging to secondary subgroups (and also by lithium and magnesium) are of the hydroperoxide type. It was established that perhydrates of the peroxides of metals of the first group upon dehydration form the corresponding superoxides.

I. I. Vol'nov (Moscow) developed methods for the preparation in a reproducible manner of peroxides [this presumably should be superoxides] of calcium, strontium, and barium from the diperoxyhydrates of peroxides of these metals.

T. V. Rode, T. K. Trishenkova, and A. V. Zachatskaya (Moscow) investigated the interaction of sodium peroxide and sodium superoxide with the carbonate and hydroxide of sodium. The investigation was conducted by the methods of physicochemical analysis (thermographic, thermogas-volumetric, X-ray, and chemical methods).

S. I. Vol'fkovich, N. N. Postnikov, L. A. Ionass, V. V. Illarionov, and R. Ye. Remen (Moscow) developed a new thermal process for the intensive defluorination of nonenriched Khibinsk apatite-nepheline and also of Kara-Tau phosphorite by treating them with steam at the fusion temperatures of the minerals being converted. As a result of this treatment, fertilizers are obtained which contain phosphate that is assimilated by plants. Fluorine is eliminated in the form of gaseous compounds by this treatment. By applying this method, Kara-Tau phosphorites containing magnesium can be treated successfully without any additions. The process is carried out in a furnace of the cyclone type by means of which the material is subjected to treatment under rigorous conditions. The product can be used as a concentrated fertilizer or as an ingredient of animal feeds.

A number of reports were presented in the Section of the Chemistry of Coordination Compounds. Many of these reports dealt with the investigation of coordination compounds in connection with research on the chemistry of rare elements. Thus, E. P. Deychman (Moscow) investigated the composition and properties of indium oxalates and indium-alkali metal oxalates; M. D. Lyutaya and I. V. Tananayev (Moscow) investigated the formation, composition and properties of mixed hexanitronickeloates of rare-earth elements; and Z. A. Sheka and Ye. Ye. Kris investigated the extraction of lanthanum, neodymium, yttrium, and ytterbium nitrates from nitric acid solutions with solutions of tributylphosphate and dibutylphosphate in carbon tetrachloride and also the processes of complex-formation which take place in connection with this type of extraction.

About 30 reports were given at meetings of the Section of Agricultural Chemistry, Fertilizers, and Insectofungicides. Results of work done at the Kazan' Chemical Institute of the Academy of Sciences USSR concerning new agents effective as pesticides were reported by V. A. Arbuzov (Kazan'). The most interesting compound among those investigated in the new work was a mixed diethyldimethyl ester of dithiopyrophosphoric acid. A number of acyl derivatives of dipterex were synthesized. The effectiveness of these derivatives as insecticides and their toxicity were investigated. It was established that acylation of dipterex with organic acids lowers the toxicity of this compound to warm-blooded animals while only insignificantly reducing its activity as an insecticide.

S. I. Vol'fkovich (Moscow) gave a report on an investigation conducted by him together with a group of coworkers at Moscow State University in regard to new types of highly concentrated multipurpose

fertilizers which do not contain any useless ingredients. Introduction of insignificant quantities of salts into the composition of potassium, ammonium, and magnesium phosphates makes it possible to produce by heating polymer fertilizers having different solubilities and consequently exhibiting different velocities of assimilation by plants. By interacting carbamide with paraform, urotropin, phosphates, and other substances one obtains polymerized fertilizers producing a persistent effect which are not washed out of the top soil by rain or irrigation water.

M. Kh. Chaylakhyan (Moscow) reported on the application of gibberellins as new growth stimulants. Extensive tests with the view of applying substances of this type in practical agriculture are now being conducted in the USSR and other countries.

N. N. Mel'nikov (Moscow) gave a paper on the synthesis and investigation of the properties of a new class of organophosphorus insecticides. He advanced a number of interesting assumptions concerning the mechanism of the action of organophosphorus insecticides on insects and reported on the results of work dealing with a new method for the preparation of esters of dithiophosphoric and dithiopyrophosphoric acids. Compounds of this type are of interest from the standpoint of their applications as insecticides, herbicides, and defoliants.

In the Section of the Chemistry and Technology of Silicates, V. V. Vargin, and G. O. Karapetyan (Leningrad) gave a paper describing the results of an investigation of the absorption spectra, luminescence, and photochemical properties of glasses containing cerium. These glasses exhibit a considerable stability to the action of ionizing radiation. In the experiments described, cerium was introduced in different concentrations into silicate, borate, borosilicate, and phosphate glasses with a simple composition. The changes to which cerium was subjected were determined on the basis of absorption spectra and luminescence and also by investigating the thermoluminescence of the glasses under study. As a result of the investigation conducted, it was established that both trivalent and tetravalent cerium is present in the glasses at the same time. Trivalent cerium functions as the activator of luminescence.

About 80 communications were made at meetings of the Section of Theoretical and Applied Electrochemistry. D. P. Semchenko and K. G. Il'in (Novocherkassk) reported on the formation of higher oxygen compounds of chlorine in electrochemical processes. Correlation of experimental data obtained by the electrolysis of chloride solutions with experimental data obtained in the investigation of the anodic polarization of smooth platinum surfaces in the same solutions led to the conclusion that the formation of alkali and alkaline earth metal perchlorates takes place as a result of the primary discharge of Cl^- and OH^- ions followed by secondary chemical and electrochemical reactions.

N. T. Kudryavtsev, G. N. Smolenskaya, V. M. Karatayev, and R. G. Golovchanskaya (Moscow) determined the best conditions for the electrolytic coating of titanium and coating with titanium. The results obtained in this work are of great importance from the standpoint of practical applications in machine building and in the construction of instruments. M. F. Lantratov and A. F. Alabyshev (Leningrad) proposed a new low-melting electrolyte for the production of metallic sodium. They investigated the principal characteristics of the ternary electrolyte $NaCl-CaCl_2-BaCl_2$ and conducted experiments on prolonged electrolysis of this mixture in an electrolytic cell operating at a current strength of 3,000 amperes. Use of the electrolyte in question makes it possible to achieve superior technological indices.

The Section of Basic Processes and Chemical Industry Equipment was the first of its kind to form a part of a Mendeleyev congress. For this reason the meetings of this section attracted great attention on the part of both USSR and foreign scientists. During the 4 days on which meetings of this section were held, 75 communications were presented in the following principal subdivisions: (1) general problems and hydrodynamic processes, (2) thermal processes, and (3) problems pertaining to mass transfer. Among the paper given in this section, one by M. L. Varlamov and co-workers (Odessa) dealt with the industrial purification of gases by the acoustic coagulation of aerosols. In the field of heat exchange, relationships discussed in a paper by N. K. Yelukhin, M. Ye. Ivanov, and I. P. Vishnevyy and established by investigating heat exchange during the condensation and boiling of oxygen, nitrogen, and argon make it possible to design condenser-evaporators for air-separation installation and also other equipment. In the field of mass-transfer, V. A. Malyusov, N. N. Umnik, and N. M. Zhavoronkov (Moscow) reported on investigations dealing with multistage molecular distillation. Of interest from the standpoint of practical applications are data on the separation of azeotropic mixtures by the method of salt rectification, a method investigated by L. L. Dobroserdov (Leningrad).

N. I. Gel'perin (Moscow) investigated extraction from solutions in counter-current injector columns. A number of reports on the investigation of the operation of pulsating extracting columns was given by S. M. Karpacheva, A. M. Rozen, and others. Interesting data were obtained by S. Z. Kagan and M. E. Aerov (Moscow) in connection with the investigation of extractors with mechanical agitation of phases.

In the four subsections of the Section of Organic Chemistry, more than 200 reports were presented. The reports were diverse in character and dealt with a range of subjects including reaction kinetics, the improvement of processes that are already known, the synthesis of new compounds needed in the national economy, and the development of more efficient catalysts. A number of reports by A. P. Nesmeyanov and

his coworkers (Moscow) were concerned with developments in the new field of ferrocene chemistry. Ye. A. Karpeyskaya, A. A. Tcvstopyatova, and A. A. Balandin (Moscow) established in work done by them that rhenium is a very efficient catalyst for a number of organic reactions such as the dehyrogenation of alcohols and of cyclohexane hydrocarbons and also the dehydrogenation of cumene to α-methylstyrene.

In a number of papers that were presented, new catalysts were proposed that would replace mercury compounds in the hydration of acetylene. Methods for the oxidation of paraffin wax, of monobasic carboxylic acids to dibasic acids, and of ethylene to ethylene oxide were discussed in a number of papers. Many reports dealt with the chemistry of organophosphorus compounds, the vinylation of organic substances, the destructive nitration of oleofins, syntheses starting with carbon monoxide and hydrogen, and other types of reactions that are of importance from the standpoint of developments in organic chemistry and technology.

At meetings of the Section of Chemistry and Technology of Polymers, more than 80 reports were presented on work dealing with the development of new polymer materials, the investigation of the behavior of these materials in actual use, and modification of the properties of polymers in a desired sense. Soviet scientists have developed new polymers of the following types: radioactive resins which can be used as drugs and as a source of [radiation] pulses, elastomers containing synthetic resin fillers, ion-exchange resins, heat-resistant organosilicon polymers containing aluminum, etc. A. A. Vansheydt and N. N. Kuznetsov (Leningrad) reported on the polycondensation of phenoxyacetic acid with formaldehyde, a method by which weakly acidic ion-exchange resins are synthesized. The investigations carried out by them showed that phenoxyacetic acid reacts with formaldehyde in the presence of strong inorganic acids. When the reaction is carried out under mild conditions, resins that have a low melting point and dissolve in aqueous alkalis are formed. When the reaction is carried out under more rigorous conditions [in the presence of appropriate reagents] and an excess of formaldehyde is present, insoluble three-dimensional polymers can be obtained which contain chlorine and phenolic hydroxyl groups in addition to carboxyl groups. As compared with KF-4 resin, cation-exchange resins of this type exhibit an exchange capacity which is only half as great. On the other hand, they show a very high degree selectivity as far as adsorption of streptomycin and other large organic ions is concerned. V. P. Zubov (Moscow) investigated the polymerization of styrene in the presence of some halides. The mixing of the components was carried out by simultaneous evaporation in vacuum onto a surface cooled with liquid nitrogen. Polymerization took place when the colloidal ice that had formed melted on growing crystals of salt. It was established that under these conditions the solid surface of salts such as $TiCl_3$ or $BeCl_2$ does

not catalyze stereospecific polymerization; stereospecific polymerization takes place only when the salts in question have combined with metal alkyls.

V. V. Korshak, S. L. Sosin, and M. V. Chistyakova (Moscow) reported results demonstrating that one can utilize reactions of free radicals with unsaturated compounds to produce linear polymers. They investigated the characteristics of this type of reaction and the conditions under which it takes place.

K. A. Andrianov (Moscow) reported on a new type of high-molecular compounds, namely polyorganoalumosiloxanes, the molecular chains of which consist of atoms of silicon, oxygen, and aluminum. A synthesis of polyorganoalumosiloxanes from phenyltrichlorosilane and/or ethyltrichlorosilane and aluminum chloride was carried out. The properties of the polymers obtained were investigated and conclusions were drawn concerning the structure of their polymer chains.

Z. N. Tarasova, M. Ya. Kaplunov, P. A. Klauzen, B. A. Dogadkin, and V. L. Karpov (Moscow) investigated the kinetics of the radiation vulcanization of some synthetic and natural elastomers as well as the physicochemical and mechanical characteristics of vulcanizates obtained by irradiation in a nuclear reactor or by means of a Co^{60} source with a total dose of 10^7 -10^8 roentgens. In comparison with the best sulfur-vulcanized rubber which contains the same quantity of fillers, radiation vulcanizates exhibit an increased stability to ageing (higher by a factor of 4-5 at a temperature of 130°) and show low residual deformation, a low hysteresis, a high resistance to multiple deformations, and a superior resistance to wear. However, the tensile strength of radiation vulcanizates is not as high as that of the best grades of sulfur-vulcanized rubber.

N. A. Glukhov (Leningrad) synthesized a number of polymeric organo-metallic chelates based on metal derivatives of acetylacetone and of tetraketones of different structure. As metal compounds for this type of synthesis the acetylacetonates of zinc, magnesium, copper, nickel, cobalt, rhenium, and other metals were used. A high degree of resistance to fire is typical for the polymers which have been synthesized.

About 70 reports were presented and discussed in the Section of Chemistry and Chemical Technology of Fuels. This section was subdivided into two subsections: a petrochemical sub-section and a coal-chemical sub-section. In the reports presented in these subdivisions, the cardinal problems of the chemistry and technology of natural and petroleum gases, petroleum, coal, and oil shale were discussed.

In a report on the prospects of the expansion of the production and use of hydrocarbon gases, N. V. Lavrov (Moscow) brought out the possibilities opened up by industrial organic synthesis based on the conversion of natural and petroleum gases to chemical raw materials, specifically as far as the production of acetylene, ethylene, and other valuable products is concerned. Of potential importance is the information given in a report by A. A. Kruglikov (Nizhniy Tagil) concerning the isolation and utilization of bifunctional phenols produced in connection with the low-temperature coking and hydrogenation of Cheremkhovo coals. Of great interest is the production of epoxy resins by the condensation of bifunctional phenols with epichlorohydrin in the presence of alkali. The epoxy resins produced by this method are not inferior in quality to those derived from diphenylol propane, which is in short supply.

New methods for the production of hydrogen by processes utilizing solid fuels as raw material were described by V. V. Lebedev (Khimki). The method in question are distinguished by the small size of the equipment required and high efficiency of the conversion. They can be applied at enterprises of the chemical industry and in oil and fat conversion. V. I. Isagulyants and V. N. Tishkova (Moscow) discussed the scientific aspects of the synthesis of alkyl- and arylphenols used as additives to mineral oils and motor fuels. Reports by N. I. Shuykin, N. G. Bekauri, and G. N. Maslyanskiy (Moscow) dealt with the catalytic isomerization of paraffinic hydrocarbons, a type of conversion which leads to improvement of the quality of motor fuels and makes possible the production of valuable initial materials for the synthesis of elastomers and other polymers.

Yu. B. Khmel'nitskiy, K. I. Zimina, A. A. Polyakova, and V. M. Nikitina (Moscow) reported interesting data on the radiolysis of different types of hydrocarbons. They also developed a mass-spectrometric method for the determination of the structural group composition of gasolines. This method is based on the dependence of the mass spectrum on the molecular structure.

M. A. Geyman and A. D. Larin (Moscow) synthesized a number of anionic surface-active substances from petroleum and from distillates obtained by processing petroleum, lignite, shale and peat.

13. A Vacuum-Thermic Method For the Production of Metallic Potassium

"Production of Potassium Metal by a Vacuum-Thermic Method," by A. Yu. Tayts and V. M. Chel'tsov; Moscow, Khimicheskaya Promyshlennost', No 5, Jul/Aug 59, pp 404-408

Among the known methods for the production of potassium, the vacuum-thermic methods present a decided advantage, in the opinion of the authors. These methods have been applied extensively in recent

years for the production of a number of alkali and alkaline earth metals. Methods of this type are based on the reduction of potassium chloride in vacuum with metals or metal alloys (the metallothermic procedure) or with calcium carbide (the carbidothermic procedure). Laboratory experiments on the reduction of sodium chloride and potassium chloride with silicon alloys have been conducted by N. M. Nikolayshvilli. Subsequently, V. M. Gus'kov, N. M. Zuyev, and A. I. Voynitskiy investigated more thoroughly the reduction of potassium chloride with aluminum and silicon alloys, demonstrating that potassium can be produced by this method. On the basis of the results obtained by Gus'kov, Zuyev, and Voynitskiy, the investigation described in this instance was carried out. Ferrosilicon and silicoaluminum were used as reducing agents. The conversion was carried out on a pilot-plant scale. When ferrosilicon was used as a reducing agent, satisfactory yields of potassium were obtained only after calcium fluoride had been added to the charge. In the case of silicoaluminum the velocity of the reaction with aluminum was greater than with silicon. Addition of calcium fluoride helped, but was not absolutely necessary: adequate yeidls were obtained without it. The chief advantage of conducting the process with silicoaluminum is the low rate of use of the reducing agent, which is the most expensive material that enters into the process.

A complete flowsheet for the industrial process to be carried out on the basis of the results described is proposed. The design of a vacuum distillation furnace that was used for the conversion is described.

14. Use of Explosives in the Mining of Potassium Salts

"The Application of Explosives in the Potassium Industry," by A. N. Andreichev; Moscow, Khimicheskaya Promyshlennost', No 5, Jul/Aug 59, pp 418-419

The advantages and disadvantages of using safety explosives as compared with non safety explosives are discussed on the basis of procedures applied in the GDR and USSR. The explosives used in the GDR are compared with those used in the USSR. Although methane and hydrogen may evolve in potassium salt mines, ordinary explosives are preferable to safety explosives for blasting in these mines, because their use would promote the combustion of hydrogen. In view of the fact that safety explosives contain 15-20% of potassium chloride or sodium chloride as a flame-extinguishing component, any explosive would become a safety explosive when used in a potassium salt mine.

On the basis of the considerations presented, it is concluded that the application of safety explosives in potassium salt mines is inadvisable and that it is desirable to use more powerful explosives, for instance rock ammonite or donarites (e.g., donarite I - II or gelatine-donarite). Best suited for blasting in potassium salt mines are the so-called rock ammonites produced industrially in the USSR. Their efficiency and brisance are considerably higher than that of any ammonium nitrate explosives (cf. table 3, p 419, in which characteristics of ammonites No 6-ZhV, AP-1, donarite, gelatine-donarite, and the rock ammonites No 1, Zh V [pressed], and No 2 are listed).

15. A New USSR Detonator for Blasting in Mines

"Experience in the Application of Millisecond Blasting in the Chemical Raw Materials Mining Industry," by A. N. Degtyatrev and E. M. Kushnarev, State Institute of Mined Chemical Raw Materials; Moscow, Khimicheskaya Promyshlennost', No 5, Jul/Aug 59, pp 445-446

The advantages of using the electrical detonator ED-KZ with a pyrotechnic charge producing a short delay are described. (The pyrotechnic charge sets off lead azide which is placed behind it.) Detonators of this type are set for a graduated scale of delay intervals amounting to 25, 50, 75, 100, 150, and 250 milliseconds. By using detonators of this type for the successive detonation of charges in potassium salts, apatite, and phosphorite mines, a greater yield of blasted rock is achieved under proper conditions and the use of explosives for a single blasting is reduced by 15-20%.

16. Developments in the Field of Powder Metallurgy Products and Cermets

"Cermet Materials for Chemical Machine Building," by G. V. Samsonov, Doctor of Technical Sciences, and S. Ya. Plotkin, Candidate of Technical Sciences; Moscow, Khimicheskoye Mashinostroyeniye, No 4, Jul/Aug 59, pp 37-40

The subject of high-melting metals, alloys, and cermets is reviewed from the standpoint of the application of these materials in the construction of chemical equipment. A bibliography consisting of 22 USSR references and 5 non-USSR references follows the article. The work done by G. V. Samsonov and his collaborators is represented to a prominent extent in the review and the bibliography. The suitability of tantalum as a material for the construction of corrosion-resistant chemical equipment is pointed out with the references to the resistance

of this metal to the action of nitric acid, hydrogen peroxide, and other chemicals. The resistance of titanium to the action of nitric acid is also pointed out.

According to the author, tungsten and molybdenum do not exhibit a high corrosion resistance; however, the alloys of these metals with other metals have a number of valuable properties, including resistance to corrosion. An alloy of tungsten with nickel and copper that is produced by powder metallurgy procedures is used for protection from the action of γ-rays; and alloys of molybdenum with nickel, cobalt, and chromium are stable at high temperatures and resistant to the action of nitric, sulfuric, and hydrochloric acids.

It is stated that wear-resistant and corrosion-resistant compounds of high-melting metals with carbon, boron, silicon, and nitrogen are being applied to an increasing extent as materials for the construction of industrial chemical equipment. The advantages of chromium carbides and alloys based on them, which are cheap and exhibit a particularly high chemical stability, are discussed in detail.

The author states that boron carbide and silicon carbide have a still greater chemical stability and resistance to corrosion then compounds derived from metals. In addition to exhibiting resistance to the action of acids, boron carbide is very hard and wear-resistant. Products made of boron carbide withstand the action of dilute and concentrated acids and their mixtures for a long time up to the boiling points of these acids and mixtures; nitric and hydrofluoric acids exert a very weak effect on these materials.

Products made of silicon carbide exhibit a high resistance to the action of inorganic acids at elevated temperatures.

Borides of high-melting metals exhibit a high degree of resistance to oxidation at elevated temperatures (K. D. Modylevskiy and G. V. Samsonov, Ukrainskiy Khimicheskiy Zhurnal, No 1, 1959, p 25). Products made of alloys based on this material, the borides of tantalum, niobium, zirconium, molybdenum, and tungsten, and also the alloy of boron with silicon have a superior chemical stability. Also very stable chemically is titanium boride, which is impervious to the effect of a mixture of nitric acid with hydrochloric acid and withstands the action of boiling mixtures containing oxalic acid, nitric acid, perhydrol, and other chemicals.

A high degree of resistance to the action of caustic alkalis and to oxidation in air at high temperatures is furthermore typical of metal nitrides (G. T. Kabannik, Informatsionnoye Pis'mo Instituta

Metallokeramiki i Spetssplanov AN UkSSR [Information Letter of the Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR] No 125, 1958).

Properties similar to those of boron nitride cf. K. Taylor, Ind and Eng Chem, Vol 47, 1955, p 2506) are exhibited by silicon nitride.

Silicides of high-melting metals are distinguished by a particularly high chemical stability (G. V. Samsonov, Silitsidy i Ikh Ispol'zovaniye v Tekhnike [Silicides and Their Application in Technology], published by the Academy of Sciences Ukrainian SSR, Kiev, 1958). Molybdenum disilicide is the most stable of all known metal compounds and alloys. Products made of this alloy are resistant to the action of molten sodium, lead, tin, zinc, and bismuth. It was established that upon oxidation the surface of molybdenum disilicide becomes covered with a thin film consisting of silicon dioxide, which gives to parts made of molybdenum disilicide their exceptional chemical stability. Equipment parts made of molybdenum disilicide have a useful life of 3,000 hours at 1,650-1,700° (G. V. Samsonov and V. S. Neshpor, Ogneupory No 2, 1958, p 28).

Pipes and also spirals, rods, and other products of different shapes can be produced from nonductile high-melting compounds. This type of production is based on the simultaneous application of nozzle extrusion and pressure molding in the processing of powder consisting of the high-melting compounds to which a plasticizer has been added (P. S. Kislyy and G. V. Samsonov; Kiev, Doklady Akademii Nauk UkSSR, No 1, 59, p 27). Strips and sheeting from high-melting compounds can be produced in the same manner.

A method has been developed for increasing the strength of parts and equipment made of graphite or of heat-resistant or ordinary steel. This method is based on the coating by a diffusion method of the surface of the material with a layer of a high-melting compound (G. V. Samsonov, Informatsionnoye Pis'mo Instituta Metallokeramiki i Spetssplavov AN UkSSR, No 107, 58).

17. Nature of the Effect Exerted by Polytriflucrochloroethylene Coatings Protecting Metals Against Corrosion

"Investigation of the Mechanism of the Protective Action Exerted by Polytrifluorochloroethylene Films and of the Crystallization of Such Films," by L. A. Sysina and V. A. Kargin; Moscow, Zhurnal Neorganicheskoy Khimii, No 5, Jul/Aug 59, pp 378-383

On the basis of the experiments which have been conducted it is concluded that the protective action which polytrifluorochloroethylene coatings exert in preventing corrosion of metals, such as aluminum AD.1 M

and steel 12Kh5MA by nitric acid, is due not so much to the impermeability of the coating as to its adhesion to the metal. Crystallization of the polytriflucrochloroethylene reduces the adhesion and consequently impairs the protective effect.

18. New Chemical Equipment

"New Equipment for the Chemical Industry," (unsigned article), Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 4 Sep, p 1

Engineers of the Experimental Automation Design Office of the State Committee for Chemistry of the Council of Ministers USSR, have developed new apparatus for the chemical industry. The FKZh-1 apparatus which employs a photoelectric cell for detecting the slightest change in the density of chemical solutions is now being tested. It has been designed for determining the concentration of the cuprammonium solution which is used in purifying chemical raw material from traces of carbon monoxide.

Several types of apparatus for determining the presence of oxygen in explosive gas mixtures have been devised. The apparatus DPG-5-52 and the magnetic gas analyzor MGK-3 records even the most insignificant traces of oxygen. A time-saving device FKG-1 is used for controlling the synthesis processes for ammonia, ethylene and methanol. Whereas the usual chemical analysis took 2 hours, the new apparatus can report the results in 2 minutes.

Inorganic Chemistry

19. A Method for the Preparation of Boron Trifluoride

"A Simple Method For the Preparation of Gaseous Boron Trifluoride," by I. V. Andreyeva, Institute of High-Molecular Compounds, Academy of Sciences USSR; Leningrad, Zhurnal Prikladnoy Khimii, Vol 32, No 8, Aug 59, pp 1855-1857

A method for the preparation of pure gaseous boron trifluoride by the decomposition of phenyldiazonium fluoroborate according to the equation

$$C_6H_5N_2BF_4 \longrightarrow C_6H_5F + N_2 + BF_3$$ is described.

The phenyldiazonium fluoroborate was prepared according to G. Balz and G. Schiemann Ber. Vol 60, 1927, p 1186.

20. High Fungicidal Activity Exhibited by Newly Synthesized Compounds

"From the Field of Organic Insectofungicides. XLIV. Synthesis of Some Amides of Aromatic Sulfonic Acids," by N. N. Mel'nikov and S. N. Ivanova, Scientific Research Institute of Fertilizers and Insectofungicides; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 2839-2843

The purpose of this work was to study the fungicidal properties of a number of amides of p-chlorobenzene- and p-toluenesulfonic acids which had not been described in the literature before.

Anilides of p-chlorobenzene- and p-toluenesulfonic acids were synthesized by the authors by reacting the corresponding sulfonic acid chlorides with an excess of aniline or with one mole of aniline in the presence of pyridine. The nitroanilides of the corresponding sulfonic acids were prepared by nitrating the anilides with an excess of nitric acid in the presence of small quantities of sulfuric acid. The authors noted that upon reacting p-chlorobenzenesulfonic acid chloride with 2,4,5-trichloroaniline in the presence of pyridine 2,4,5-trichloroanilide of p-chlorobenzenesulfonic acid and also considerable quantities of bis-(p-chlorobenzenesulfo)-2,4,5-trichloroanilide are formed.

The previously undescribed sodium, copper, and zinc salts of 2,4-dinitroanilide of 4-methyl-3-nitrobenzenesulfonic acid exhibited "rather high" fungicidal activity.

21. α-Oxides of Polycyclic Halohydrocarbons Exhiciting Insecticidal Activity Synthesized

"From the Field of Organic Insectofungicides. XLIII. The Synthesis of α-Oxides by Oxidation of Polycyclic Haloderivatives With Hydrogen Peroxide," by S. D. Volodkovich, L. G. Vol'fson, K. V. Kuznetsova, and N. N. Mel'nikov, Scientific Research Institute of Fertilizers and Insectofungicides; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 2837-2839

Several cyclic α-oxides exhibit strong insecticidal action and are used to control plant pests. In the search for newer and better insecticides the authors have studied the direct oxidation of several haloderivatives of polycylic hydrocarbons by hydrogen peroxide. First, aldrin and

isodrin were oxidized to obtain dieldrin and endrin which previously could be synthesized only by the oxidation of aldrin and isodrin with organic peracids or with hydrogen peroxide in the presence of pervanadic or pertungstic acids.

The authors oxidized the haloderivatives of polycyclic hydrocarbons with 27-30% hydrogen peroxide in 80-99% acetic acid. Results showed that nearly all the compounds studied yielded α-oxides in good yield. Among the compounds of which the authors studied the oxidation were 1,2,3,4-tetrachloro-10,10-difluoro-1,4,5,8-diendomethylene-1,4,4a,5,8,8a-hexahydronaphthalene, 1,2-dichloro-3,4,10,10-tetrafluoro-1,4,5,8-diendomethylene-1,4,4a,5,8,8a-hexahydronaphthalene, 1,2-dichloro-3,4,10,10-tetrafluoro-1,4,5,8-diendomethylene-1,4,4a,5,8,8a-hexahydronaphthalene, 1,2,3,4,-tetrachloro-1,4,5,8-diendomethylene-1,4,4a,5,8,8a-hexahydronaphthalene and 1,2,3,4,10-pentachloro-1,4,5,8-diendomethylene-1,4,4a,5,8,8a-hexahydronaphthalene (these compounds were recently synthesized in the authors' laboratories), from which the corresponding, previously unknown α-oxides were obtained.

The authors found that the yield of the α-oxide depends to a considerable degree, on its resistance to the action of water. The yield of the more stable oxides was higher.

The properties of the compounds obtained are listed in a table. The insecticidal activity of the oxides "runs parallel to the activity of the initial unsaturated compounds."

Nuclear Fuels and Reactor Construction Materials

22. Separation of Transuranium Elements and Radioactive-Rare-Earth Elements by Ion-Exchange Chromatography

"Applications of Ion-Exchange Chromatography for the Separation of Transuranium Elements and Radioactive Rare-Earth Elements," by B. K. Preobrazhenskiy, Candidate of Chemical Sciences; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, Aug 59, pp 521-526

The subject is reviewed on the basis of both USSR and non-USSR publications. Considerable attention is paid to the author's own work in this field. A bibliography consisting of ten USSR and ten Western references is appended to the article. The author points out that the far transplutonium elements have a very short half-life before undergoing spontaneous

fission or alpha-decay and that the application of ion-exchange methods for their separation is very difficult or totally impossible. To illustrate this point, he states that the new element 102 discovered as a result of work in which G. Seaborg and his group (US) and Flerov's group in the USSR participated, has a half-life of only 3 seconds (this refers to the isotope with the mass of 254). By applying the ion-exchange method only the separation and identification of the daughter-element Fm^{250} could be achieved. This element is formed as a result of alpha-decay. The statement in regard to the unsuitability of the ion-exchange method for the separation of far transplutonium elements is qualified by the remark that some isotopes of elements that will be discovered in the future may have a longer half-life.

23. Periodate Coordination Compounds of Rare-Earth Elements

"Periodate Coordination Compounds of Rare-Earth Elements," by I. P. Alimarin and I. V. Puzdrenkova; Moscow, Vestnik Moskovskogo Universiteta--Seriya Matematiki, Mekhaniki, Astronomii, Fiziki Khimii, Vol 14, No 2, Aug 59, pp 213-216

It was established that periodate complex compounds of lanthanum, cerium, praseodymium, erbium, and thorium are formed in potassium hydroxide solutions. It was found that cerium forms one coordination compound, being present in the tetravalent state. Trivalent cerium which may be present is oxidized to tetravalent cerium by the potassium periodate. By applying the method of ion exchange, it was established that cerium and other rare earth elements form complex anions. No lithium salts of the periodate coordination compounds of cerium and praseodymium could be isolated, because lithium periodate separates together with these salts.

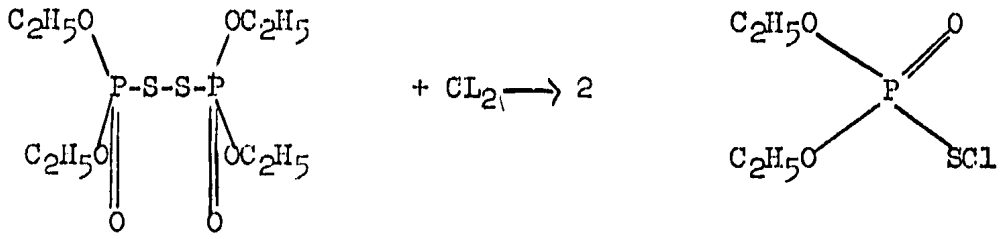
Organic Chemistry

24. S-Chlorodiethylthiophosphate Synthesized by New Method

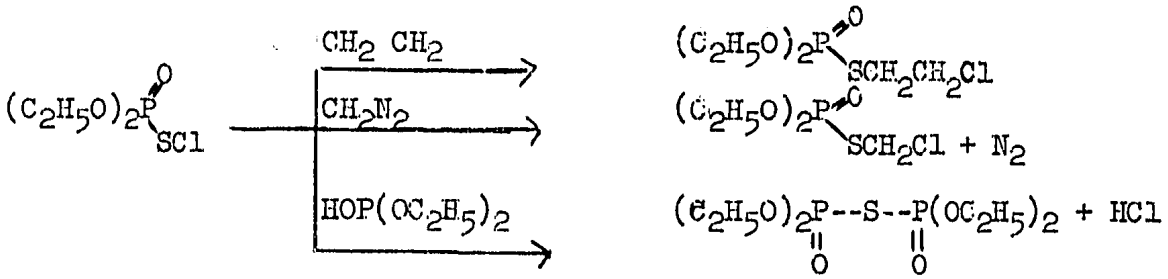
"S-Chlorodiethylthiophosphates," by K. A. Petrov and A. A. Neymysheva; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 3030-3032

The synthesis and properties of S-chlorodiethylthiophosphate are described in this work. The authors state that when they were in the final stages of this investigation, the results of work by Michalski and Lenard (I. Michalski and B. Lenard, Roczn. Chem., 30, 655 (1956)) were published in which S-chlorodiethylthiophosphate was obtained by the reaction of sulfuryl chloride with diethylthiophosphate.

The authors synthesized this substance by the cleavage of tetraethylbisthiophosphate with chlorine or with sulfuryl chloride at room temperature:



S-chlorodiethylthiophosphate forms addition products with ethylene and cyclohexane and reacts with diazomethane to form O, O-diethyl-S-β-chloroethylphosphate, O,O-diethyl-S-β-chlorocyclohexylphosphate and O,O-diethyl-S-chloromethylphosphate, respectively. It reacts with diethylphosphite to form tetraethylpyrothiophosphate.



25. Derivatives of Phosphonsulfonic Acids Synthesized

"Synthesis of Derivatives of Phosphonosulfonic Acids," by K. A. Petrov and A. A. Neymysheva; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 3026-3030

The patent literature gives a description of the synthesis of esters of trimethylenophosphonsulfonic acid by reacting trialkylphosphites with sulfones with the application of heat. In the present investigation, the authors have synthesized substances of this type by the addition of dialkylphosphites to derivatives of vinylsufonic acid.

The reaction with phosphites was carried out by employing esters, dialkylamides, and the acid fluoride of vinylsulfonic acid; however, it was not possible in all cases to obtain the corresponding derivatives of ethylenephosphonsulfonic acid. Thus, it was not possible to add dialkylphosphites to esters of vinylsulfonic acid either in the presence of sodium alcoholate or in its absence, even when prolonged heating up to 160-170°C was applied.

Esters of dialkylamides of ethylenephosphonsulfonic acid in a yield of 60-70% were obtained after the addition of dialkylphosphites to dialklyamides of vinylsulfonic acid in the presence of sodium alcoholates with heating up to 110° for 6 hours.

In the absence of dialkylamides, the acid fluoride of vinylsulfonic acid adds dialkylphosphites in the absence of sodium alcoholates. The reaction takes place readily with heating up to 110° and proceeds with the formation of acid S-fluoride of the diester of ethylenephosphonsulfonic acid:

$$(RO)_2POH + CH_2{=}CHSO_2F \longrightarrow (RO)_2\overset{\overset{O}{\|}}{P}CH_2CH_2SO_2F$$

The alkylation of trialkylphosphites and salts of dialkylphosphites with β-halosubstituted disulfides was also studied. It was supposed that the reaction would occur with the formation of di-(2-dialkylphosphon-2-methylethyl)-disulfide. However, on reacting di-(β-chloropropyl)-disulfide with sodium diethylphosphite, diethyl-S-β-chloropropylphosphate was obtained instead of the expected product. In this case, cleavage occurs at the S-S bond:

$$(C_2H_5O)_2PONa + \begin{matrix} CH_3CHClCH_2S \\ | \\ CH_3CHClCH_2S \end{matrix} \longrightarrow (C_2H_5O)_2P(=O)SCH_2CHClCH_3 + CH_3CHClCH_2SNa$$

Di-(β-chloropropyl)-disulfide reacts with triethylphosphite to form triethylthionophosphate.

Eight new substances were synthesized and characterized as a result of this work.

26. Synthesis of 2-Trifluoromethylnapthalene Described

"2-Trifluoromethylnaphthalene and Its Derivatives," by L. M. Yagupol'skiy and Yu. A. Fialkov, Institute of Organic Chemistry of Academy of Sciences Ukrainian SSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 3082-3086

The article describes the synthesis of 2-trifluoromethylnapthalene and its 1-derivatives: 1-chloro-, 1-amino-, and 1-carboxylic acid, and the nitrile and amide of carboxylic acid.

The starting material for the synthesis was 1-hydroxy-2-naphthoic acid which was reacted with phosphorus pentachloride giving 1-chloro-2-trichloromethylnapthalene with a 35% yield. Substitution of the chlorine by fluorine in the trichloromethyl group was accomplished by heating with antimony trifluoride in chlorobenzene as solvent. A yield of 90% was obtained.

The authors found that the trifluoromethyl group of 1-amino-2-trifluoromethylnaphthalene is unstable to the action of aqueous alkali solutions. The 2-trifluoromethyl-1-naphthyl-4-dimethylaminoazobenzene was synthesized and its maxima of absorption and extinction in alcohol and alcohol-hydrochloric acid solutions were determined.

27. N-Alkyl Derivatives of Naphthalimide and Halonaphthalimides

"N-Alkyl Derivatives of Naphthalimide and Halonaphthalimides," by A. P. Karishin and V. F. Baklan, Poltava State Pedagogical Institute; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 3048-3050

The authors alkylated naphthalimide and its haloderivatives in the course of an investigation of the properties of these compounds. The reaction was accomplished by reacting potassium naphthalimide with the corresponding bromides in sealed tubes at 150°C. It was established that potassium napthalimide, as compared with its haloderivatives, can be more easily alkylated.

The potassium naphthalimides necessary for the synthesis of the alkyl derivatives of naphthalimides could be isolated from aqueous solutions on interaction with potassium hydroxide, but not from anhydrous alcohol.

A number of hitherto unknown compounds were obtained and characterized. The data are presented in one table.

28. Investigation of Reactions of Boric and Organoboric Acids With Aromatic Amines

"Organoboron Compounds. XLV. Reaction of Butyl Esters of Boric and Organoboric Acids With Aromatic Amines," by B. M. Mikhaylov and P. M. Aronovich, Institute of Organic Chemistry of Academy of Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 3124-3129

Esters of boric and organoboric acids react with primary aromatic amines, substituting the butoxyl groups by the arylamino groups. The following compounds were synthesized by this method: tri-(p-tolylamino)-boron, phenyldi-(phenylamino)-boron, phenyldi-(p-tolylamino)-boron, n-propyldi-(phenylamino)-boron, n-butyldi-(phenylamino)-boron, diphenyl-(phenylamino)-boron and di-n-butyl-(phenylamino)-boron.

The velocity of the reaction of aniline with esters increases in the order: ester of boric acid < esters of phenylboric acid < esters of diphenylboric acid.

Secondary aromatic amines react with esters of organoboric acids considerably more slowly than the primary amines.

29. Phenadone-Type Analgesics Synthesized

"Synthetic Analgesics. Derivatives of 1-Hydroxyalkyl-2,5-dimethylpiperidine," by I. N. Nazarov, N. S. Prostakov, N. N. Mikheyeva, and N. M. Mikhaylova, Moscow Institute of Fine Chemical Technology; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 2940-2942

1-Hydroxyalkyl-2,5-dimethylpiperidines can be employed for synthesizing their esters, which are local anesthetics of the methacaine and surfacaine type. They can also be used for preparing 1-haloalkyl-2,5-dimethylpiperidines which are intermediate products in the synthesis of analgesics of the phenadone type.

On benzoylation of 1- β -hydroxyethyl-2,5-dimethylpiperidine, 1-α-methyl- β -hydroxyethyl-2,5-dimethylpiperidine, and 1- β -hydroxypropyl-2,5-dimethylpiperidine the benzoates of the aminoalcohols are obtained.

The hydroxy groups were replaced by chlorine with the aid of thionyl chloride. The chloroderivatives were obtained with yields of up to 80%.

30. Study of Characteristics of Carbon-Metal Bond in Organometallic Compounds Initiated

"Study of the Nature of Carbon-Metal Bonds by the Isotope Exchange Method, I. Exchange of Ethyl Groups," by L. M. Nazarova, Physicochemical Institute imeni L. Ya. Karpov; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 8, Aug 59, pp 2671-2674

The method of isotope exchange in the field of organometallic compounds, first applied by Hevesy in 1920, has been used principally for the study of the exchange of the central atom (e.g., lead in tetraphenyllead or tetraethyllead, or of mercury in organomercury compounds) or of peripheral halogen atoms in incomplete organometallic compounds.

In contrast to the above-mentioned lines of research, G. A. Razuvayev and coworkers have studied the exchange between diphenylmercury and benzene tagged with deuterium and also between the hydroxide of phenylmercury and benzene tagged with deuterium. This work was later repeated but with the use of benzene tagged with C^{14} whereby the results of the previous work were confirmed. The exchange of hydrocarbon radicals has been studied only in two investigations.

The exchange of dissimilar radicals, for example methyl or ethyl and phenyl, has been studied in a number of investigations without using radioactive isotopes and the exchange between ethyl and chlorine groups in the system $(C_2H_5)_4Pb + (C_2H_5)_3PbCl$ has been investigated using radioactive lead (RaD). The exchange of identical radicals between organometallic compounds containing different metals has not been studied at all. The study of this exchange, in the author's opinion, can yield valuable information on the comparative stability of the C-Me bond formed by different metals.

In the present work the author has conducted experiments to study the exchange of ethyl groups between organometallic compounds in eight systems: (1) diethylmercury-ethylsodium, (2) diethylmercury-ethylmagnesium bromide, (3) diethylmercury-diethylzinc, (4) diethylmercury--triethylaluminum, (5) diethylmercury--tetraethyllead, (6) tetraethyllead--ethylsodium, (7) tetraethyllead-ethylmagnesium-bromide and (8) tetraethyllead-triethylaluminum. Compounds tagged with C^{14} were used.

The author found that in the more stable diethylmercury the exchange proceeds better than in the less stable tetraethyllead, where the effect of steric hindrance may be assumed. The exchange proceeds well in the systems diethylmercury-triethylaluminum and tetraethyllead-triethylaluminum In the latter case, steric hindrance does not play any role.

The study of the nature of the carbon--metal bond by the exchange of identical radicals has only just begun. The research will be continued.

31. New Antispasmodic Substance Surpasses Artane in Activity

"Synthetic Antispasmodic Substances. Synthesis of 1-Phenyl-1-cyclohexyl-3-(2',5'-dimethylpiperidyl-1')-propanol-1; by I. N. Nazarov, N. S. Prostakov, E. M. Raskina, N. N. Mikheyeva and L. G. Stolyarova, Moscow Institute of Fine Chemical Technology; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 9, Sep 59, pp 2861-2964

The synthesis of new tertiary amnioalcohols is described. This method employs an intermediate product for the synthesis of the analgesiev promedol, (i.e., propenylisopropenylketone. According to preliminary pharmacological data obtained by M. D. Mashkovskiy of the All-Union Scientific Research Chemicopharmaceutical Institute, the hydrochloride of 1-phenyl-1-cyclohexyl-3-(2',5'-dimethylpiperidyl-1')-propanol-1 exhibits pronounced antispasmodic activity which somewhat surpasses that of artane.

Physical Chemistry

32. Properties of Tin Crystals

"The Structural and Mechanical Properties of Tin Single Crystals, as Affected by a Strongly Adsorption-Active Medium," by Yu. V. Goryunov, N. V. Pertsov, Ye. D. Shchukin, and P. A. Rebinder, Division of Dispersive Systems of the Institute of Physical Chemistry, Academy of Sciences USSR, Chair of Colloidal Chemistry, Moscow State University imeni Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 2, Sep 59, pp 269-272

The effect of a thin layer of liquid gallium on the mechanical and structural properties of tin single crystals, as well as on its electric conductivity is studied. The plasticity and strength of tin single crystals dropped steeply and continued to drop with time. They could be reduced to powder by finger pressure.

Radiation Chemistry

33. Soviet Review of the Effects of Nuclear Radiation on Gas Reactions

"The Effect of Nuclear Radiation on Gas Reactions," by Prof S. Ya. Pshezhetskiy, Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, Aug 59, pp 509-550

The general aspects of radiation-chemical reactions, primary elementary processes, secondary elementary processes, general relationships pertaining to radiation chemical reactions, and stationary conditions produced by the action of radiation are discussed with particular attention to USSR work, specifically work done by the author of the review. A bibliography consisting of 16 USSR reference and seven non-USSR references follows the article. In the section on secondary elementary processes, the effect of noble gases on the oxidation of nitrogen by oxygen under the effect of gamma radiation is discussed. In the section on stationary conditions produced by the action of radiation, results obtained in USSR work on the stationary conitions established in the system oxygen-ozone as a result of irradiation with fast electrons having an energy of the order of 200 kev are reviewed. The effects of irradiation on isotope exchange in the reaction $H_2 + D \rightarrow HD + H$ are discussed on the basis of US work.

Radiochemistry

34. Chemistry and Applications of Technetium, Promethium, Astatine, and Francium

"The Chemistry of the New Elements Technetium, Promethium, Astatine, and Francium," by Yu. B. Gerlit; F. I. Pavlotskaya, Candidate of Chemical Sciences; and S. S. Rodin; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, Aug 59, pp 465-472

The chemistry of technetium, promethium, astatine, and francium is discussed with particular attention to work done outside of the USSR. A bibliography consisting of 23 USSR references and 91 non-USSR references follows the article. In connection with the possibilities of applying technetium, it is pointed out that hundreds of kilograms of this element

have been produced in the US, particularly from wastes of the nuclear energy industry. Because of the exceptional corrosion resistance of metallic technetium and the low cross-section of activation with neutrons of the technetium isotope with a mass number of 99, this element is being applied at present as a construction material for nuclear reactors. The inhibiting properties of technetium depending on redox potentials make this element a suitable material for the construction of precision instruments. It is considered very probable that technetium can be used as a semiconductor material. It is furthermore pointed out that new applications of this element will be found in subsequent research.

As far as promethium is concerned, it is pointed out that the isotope Pm^{147} is of the greatest practical importance.

Pm^{147} is used as a radioactive tracer and also for the construction of miniature nuclear batteries which have the size of a drug tablet and generate 20 microwatts of power. These batteries operate on the following principle: the radiation emitted by the radioactive substance, on reaching the layer of the phosphor (cadmium sulfide), is transformed into light energy; the latter acts on a silicon photocell and generates an electric current. Promethium batteries are insensitive to temperature changes, changes of pressure, and other external influences. Pm^{147} can be used in guided missiles, receivers of small dimensions, hearing aids portable semiconductor appliances, and equipment for investigations to be carried out at great depths or high altitudes.

The francium isotope Fr^{233} is employed for the rapid determination of actinium in natural objects. M. Perey and A. Chevallier (France) have developed a rapid method for the determination of actinium on the basis of the francium formed by it. This method was subsequently applied in work done by A. K. Lavrukhina and her coworkers (cf. Uspekhi Khimii, Vol 27, 1958, p 1209). Lavrukhina investigated the isolation of francium by coprecipitation and by adsorption on the cation-exchange resin KI-2. Fr^{223} has been used extensively in biological research.

35. Separation of Yttrium-90 in a Carrier-Free State by Solvent Extraction

"Benzoylacetonates of Yttrium and Strontium and a Method for the Separation of Yttrium by an Extraction Method Using Benzoylacetone," by I. Stary and N. P. Rudenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 10, Oct 59, pp 2405-2409

The extraction of yttrium and strontium by solutions of benzoylacetone in three organic solvents (carbon tetrachloride, benzene, and chloroform) was investigated.

On the basis of the results obtained, a new and rapid method for the separation of carrier-free yttrium-90 of a high degree of radiochemical purity (greater than 99.99%) was developed.

Y^{90} is a product of the radioactive decay of Sr^{90}.

/For additional information on radiochemistry see Nuclear Fuels and Reactor Construction Materials./

III. ELECTRONICS

Communications

36. Determination of Common Characteristics of Directivity Patterns

"On Certain General Properties of Directivity Patterns of Antennas," by Ye. B. Korenberg; Moscow, Radiotekhnika, No 9, Sep 59, p 13-16

It is shown that, if any two receiving and transmitting antennas are located in free space and the distance between them is sufficiently great so that each antenna is located in the wave zone of the other, there exists an infinite number of mutual orientations for which there will be no reception. The polarization properties of directivity patterns of antennas not having power nulls (for example, turnstile antennas) are determined.

37. Carrying Capacity of Multipath Channels

"Carrying Capacity of Channels With Great Number of Paths," by B. S. Tsybakov; Moscow, Radiotekhnika i Elektronika, No 9, Sep 59, pp 1427-1433

The carrying capacity of a multipath communication channel with a great number of paths was investigated and a formula for approximate evaluation of the carrying capacity in presence of additive gaussian noises with uniform spectrum was derived. Derivation of this formula was based on experimental data obtained for reception of long-range microwaves in the troposphere. According to this formula, the carrying capacity is a function of the band-width of the signal and the ratio of signal power to the power of additive noise at the output of the channel. The derived formula for carrying capacity of the multipath channel is in good agreement with the formula previously derived by V. I. Siforov.

38. Transistorized Schmitt Trigger Circuit Described

"Schmitt Trigger Circuit with Junction Transistors," by G. P. Petin; Moscow, Radiotekhnika, No 9, Sep 59, pp 25-28

It is shown that a Schmitt trigger circuit using junction transistors has the same properties as a circuit with ordinary tubes. Inclusion of a thermistor in the circuit is proposed as a means for decreasing the effects of temperature on voltage thresholds. Circuits using the Schmitt trigger are described for forming rectangular voltage waves from sinusoidal waves, for generating rectangular voltage waves, and for generating sawtooth voltage waves.

39. Transistorized Television Receiver "Sputnik-3"

"Transistorized Television Receivers," by A. S. Angelov and V. G. Kol'tsov; Moscow, Tekhnika Kino i Televideniya, No 11, Nov 59, pp 34-41

The recently designed fully transistorized television receiver "Sputnik-3" incorporates 29 transistors and the 43LK6B picture tube with a 270 by 360 mm screen.

The thirteen type P-403 transistors used in the set have the following characteristics: operating frequency 120 Mc, current amplification factor 0.96 to 0.99 and power dissipation about 100 milliwatts. These transistors are incorporated in the following units of the receiver: R-F amplifier, local oscillator, I-F amplifier, difference-frequency amplifier and video preamplifier. The eight type P-13 transistors have the following characteristics: operating frequency 465 kc, current amplification factor 0.92-0.98 and power dissipation about 150 milliwatts. These transistors are incorporated in the following units of the set: audio-frequency amplifier, and horizontal and vertical sweep oscillators. The six type P-203 transistors have the following characteristics: operating frequency 300 kc, current amplification factor 0.94-0.98, and power dissipation 1.5 w. These transistors are incorporated in voltage converters and in the preliminary stage of horizontal sweep circuit. The transistor type P-503 with an operating frequency of 80 Mc is used in the output stage of the video amplifier. The set consumes about 12.5 w of dc power at 12 v.

The "Sputnik-3" transistorized television receiver has demonstrated that, at the present level of transistor technology, it is possible to build all of the television receiver stages with transistors, except the output stage of the horizontal sweep circuit.

40. Soviet Scientists Discover Electronic Heat Pump

"New Possibility For Concentrating Energy -- Soviet Scientists Are Working on the Development of a New Branch of Science -- Electronic Energetics" (unsigned article); Bratislava; Uj Szo [Hungarian-language daily of Communist Party of Slovakia], 9 Nov 59, p 2

"A Moscow Tass report tells how Soviet specialists found a new possibility for concentrating energy. They wanted to prepare from semiconductors an apparatus with which they could stabilize the temperature in small spaces. Such a climate regulating device releases heat if the air in the room is cold and takes heat from the space if the temperature is higher than permissible. During these experiments they discovered that the equipment produced more heat than could have been obtained from the network current consumed: when using current sufficient to produce 5.5 kilocalories of heat they got 10 kilocalories of heat. This astounding phenomenon of energy concentration seems to prove the hypothesis of Friederich Engels, that in some way the heat being radiated out into space could be reconcentrated. Kostantin Tsiolkovskiy, the great Russian scientist, also foresaw this.

"The accumulation of energy is a continuing process: stars are formed, they are destroyed, and they are formed agains; and new and larger formations form from the material shards of interstellar space. For example, the mass of our Earth increases by several thousand tons daily due to meteorites falling on it, and by the formation of organic compounds in green plants the energy of the sun's rays is concentrated and stored.

Now, Soviet scientists are working hard to cast light on the reasons for the formation of this hear surplus produced by the equipment made of semiconductors.

"The circuit in the equipment in question is made up of several types of material and it is probable that at the place where two types of material meet -- in the boundary layers -- the electrons of the flowing current are accelerated. The accelerating electrons cause the formation of the heat surplus, and the energy necessary for this is "pumped" out of the space surrounding the system of electric conduits by the electrons. Thus, the observed phenomenon does not contradict the principle of the conservation of energy; rather, it offers a new method for accumulating or concentrating thermal energy.

"This phenomenon could have very great practical significance. If we better and more completely recognize the laws for the transformation of various types of energy into one another, we may come on a very abundant and safe source of energy. It appears that with the above apparatus the Soviet researchers have found a method in which the amount of thermal energy accumulated is greater than the thermal equivalent of the electric energy invested. We can presume that a new branch of science is developing, electronic energetics, which will offer men a more abundant energy source than atomic energy and which is completely without danger."

Instruments and Equipment

41. Accurate Method for Determining Output Voltage of Frequency Detectors

"On the Theory of Frequency Detectors," by V. M. Sidirov; Moscow, Radiotekhnika, No 9, Sep 59, pp 29-39

Material from this article was presented by the author at the Scientific Session of the Scientific-Technical Society of Radio Engineering and Electrical Communications imeni A. S. Popov in May 1957 and at the radio engineering section of the society in February 1958.

The formula generally used for determining the voltage at the output of a frequency detector with an ideal limiter is shown to be inaccurate when used for a limiter which is less than ideal. General relationships are determined for the changing amplitude of the voltage at the output of a single-cycle and two-cycle frequency detector which are correct for both the ideal and less than ideal limiter. An approximate method for determining the rectified voltage and a formula for computing the error of this method are also given.

The author expresses his appreciation for assistance in this work to N. I. Chistyakov and V. A. Klyaznik.

42. Backward-Wave Oscillator

"Experimental Investigation of a Backward-Wave Spiratron," by G. A. Bernashevskiy and T. A. Novskova; Moscow, Radiotekhnika i Elektronika, No 9, Sep 59, pp 1499-1504

An experimental investigation was conducted with a backward-wave tube utilizing centrifugal-electric focusing in the 10-cm wave-length range. With this kind of arrangement, a continuous adjustment of frequency in the 30% range was obtained when only a single voltage was regulated. In case of simultaneous variation in two voltages, a band with frequency ratio of 1:1.7 (11.5-6.7 cm) was obtained. Maximum power generated in such a case was 50 milliwatts.

An interesting phenomenon in the form of "spiratron" mode of oscillations was observed, which could not be satisfactorily explained by existing modern theories.

The results of this investigation have shown that difficulties in design of the backward-wave tube with electrostatic focusing can be overcome by combining electrostatic focusing with the backward-wave mechanism, which permits obtaining not only a wide range of frequency adjustment, but also a fairly large power output.

43. Instrument for Measurement of Mismatch Attenuation

"Mismatch Attenuation Meter" (unsigned article); Moscow, Vestnik Svyazi, No 11, Nov 59, cover page

The Scientific Research Institute of the Electrical Engineering Industry in cooperation with the Central Scientific Research Institute of the Ministry of Communications USSR has designed an instrument for measurement of mismatch attenuation of station and line devices in systems transmitting signals by coaxial cables.

The technical data of the instrument is as follows: operating range is from 50 kc to 10 Mc; mismatch attenuation can be measured up to a value of 4.5 napiers; the error of measurement varies from ± 0.1 to ±0.2 napier, depending on the magnitude of quantity measured.

Materials

44-46. More Sensitive Method of Testing Coal for Presence of Germanium

"Methods of Prospecting for Germanium", by S. M. Katchenkov and M. S. Katchenkova, Leningrad State University imeni A. A. Zhdanov; Moscow, Izvestiya Vyschikh Uchebnykh Zavedeniy-Geologiya i Razvedka, No 3, Mar 59, pp 87-88

At present, coal is the principal raw material from which germanium is produced. Hitherto, the content of germanium in coal was determined by subjecting coal ash to spectroscopic analysis. One of the authors of this article found that the germanium is concentrated on the surface of the coal and in the cracks formed in the coal (this indicates that the germanium is of secondary origin and has been concentrated from aqueous solutions). A new method of spectroscopic analysis of coal for germanium has been developed by which material scraped off the surface of coal rather than coal ash is tested.

[For additional information on materials, see Chemistry, Crystal Chemistry.]

Wave Propagation

47. Electron Phenomena and Power Relationships in Oscillators

"Power Relationships of Superhigh-Frequency Tetrode Oscillators," by V. S. Mikhaylov; Moscow, Radiotekhnika, No 9, Sep 59, p 19-24

This work, a continuation of a previous article by the author ("Certain Problems of the Theory of Superhigh-Frequency Tetrode Oscillators," Radiotekhnika, Vol 12, No 12, 1957), attempts to determine the power relationships necessary for computing the operating conditions of the output circuit of super-high frequency tetrode oscillators.

Electron phenomena are examined in the region of the screen grid-anode with voltages on the screen grid less than the constant voltage on the anode of the tube. The necessary power relationships are obtained for this case and thus permit the study of the operation of the oscillator for conditions of power amplification, frequency multiplication and amplitude modulation.

48. Investigation of Twisted Wave Guides

"Twisted Wave Guides," by B. Z. Katsenelenbaum, Institute of Radio Engineering and Electronics, Academy of Sciences USSR; Moscow, Radiotekhnika i Elektronika, No 9, Sep 59, pp 1444-1447

The amplitude of waves scattered by a twisted section of rectangular or elliptical wave guide (with small eccentricity) was determined with the aid of the cross-section method. The problem can be attacked by estimating the phase velocity of natural waves for the twisted waveguide, i.e., such waves that propagate along the wave guide without distortion.

Valuable data can also be obtained by applying the method of perturbation, when the twisted wave guide is considered as a series of segments of normal wave guides twisted to a certain angle with respect to the direction of polariztion of the incident wave.

A special case is analyzed when the phase velocities of the waves are close enough to create the coupling effect in the twisted wave guide.

IV. ENGINEERING

49. Spatial Phototriangulation With the Aid of a Computer

"Spatial Phototriangulation With the Application of an Electronic Computer," by Prof A. N. Lobanov, Doctor of Technical Sciences; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Geodeziya i Aerofotos'yemka, No 2, Mar/Apr 59, pp 57-69

The analytical method reported in the above article holds strictly and does not have any conspicuous errors of method.

The accuracy of the constructed photogrammetric grid given by the method is determined only by the errors of the initial data, that is, by the errors of the photographs and their measurements.

Application of an electronic computer permits construction of a photogrammetric grid more exactly and several times quicker than on a stereoplanigraph or other universal devices. In addition, in contrast to the processing of photographs on a stereoplanigraph, the electronic computer permits the obtaining of the final result, namely, the geodesic coordinates of the determined points.

The analytical method of spatial phototriangulation does not impose any limits on the values of the elements of the orientation of the photographs. In connection with this, the necessity of conversion of the bundles of projecting rays is eliminated. On utilization of the universal devices, these conversions are accomplished very often and account for supplementary work and sometimes reduce accuracy of the phototriangulating grids.

The method of spatial phototriangulation described may be applied for solution of nontopographical problems, for example, for determination of the trajectories of an airplane and study of its behavior at different points of its trajectory.

It is expedient to develop a strict method of constructing photogrammetric grids with utilization of the elements of the exterior orientation of photographs, fixation in flight, and a method of controlling grids, and also to establish standard programs of calculation on an electronic computer applicable to these methods.

The region of applicability of electronic computers in photogrammetry is not limited to spatial phototriangulation. They may be utilized for the construction of new devices for compilation of maps. They also permit the rapid and exact solution of more complicated equations better corresponding to the real conditions for the relationship between the

coordinates of points of the terrain and of the photographs according to comparison with those equations which are employed in an ideal central projection and in ordinary universal devices.

In this manner, the electronic computer is a powerful medium of automation and of increasing the accuracy of photogrammetric processes. It will find wide application in the aerogeodesic industry in the future.

50. Conference on Computer Mathematics and Technology

"Notice-Computer Mathematics" (unsigned article); Izvestiya Sovetov Deputatov Trudyashchikhsya SSSR, 17 Nov 59, p 4

An all-union conference devoted to the exchange of results of investigations in the fields of computer mathematics and computer technology opened at Moscow State University on 16 November 1959.

51. New USSR γ-Ray and Infrared Devices for Testing and Production Control

"Soviet Introscopes", by Engr V. Belov; Moscow, Sovetskaya Aviatsiaya, Vol 18, No 252 (3422), 25 Oct 59, p 4

"Introscopes" (devices for examining the interior of opaque objects) have been developed at the Electrophysical Laboratory of the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, as a result of work done under the direction of P. K. Oshchepkov, Doctor of Technical Sciences. Continuous production can be controlled easily by using an introscope: whenever an object with an internal defect passes the introscope controller on the conveyer line, the engineer watching the television screen of the introscope notices the defect and removes the object from the conveyer by means of an automatic appliance.

By using a γ-introscope at the Electrophysical Laboratory, defects in metal machine parts could be detected, the operation of an internal combustion engine was investigated, and the process of the crystalization of steel was studied.

An ampule containing radioactive cobalt serves as the source of γ-rays. After passing through an object which is opaque to visible light, the γ-rays form an invisible image of the object. The γ-radiation impinges on a crystal made of special synthetic materials. In this crystal the principal part of the invisible γ-image is transformed into a visible image. An ordinary optical mirror reflects the visible image at a right angle toward a television transmitter and at the same time transmits the harmful γ-radiation toward a protective concrete sheld. The last stage of the arrangement is the screen of a television receiver.

An infrared introscope has also been developed at the electrophysical Laboratory. This appliance is a kind of microscope for the examination in infrared light of such materials as semiconductors, opaque plastics, ebonite, and wood. The principle of operation is approximately the same as that of the γ - introscope, with the difference that the image is magnified by 1,000 diameters or more and a different converter is used to transform infrared radiation into a visible image. When observed by means of this appliance, opaque objects appear transparent. When a steel object placed into an aluminum vessel which is filled with an opaque oil is examined by means of an infrared introscope, a transparent vessel is seen on the television screen and the object becomes visible at the bottom of the vessel. With the aid of the image on the television screen, the steel object can be removed from the vessel. By using the infrared introscope, one can see extraneous objects in opaque oil, petroleum, turbid liquids, etc.

The newly developed introscopes can be applied not only in industrial production but also in aviation engineering control and at enterprises which repair aircraft.

52. Third Congress of Soviet Architects To Be Held in 1960

"On the Third All-Union Congress of Soviet Architects" (unsigned) article); Moscow, Byulleten' Stroitel'noy Tekhniki, No 11, Nov 59, p 38

"The Council of Ministers USSR has received a proposal from the Board of the Union of Architects USSR concerning the regular Third All-Union Congress of Soviet Architects to be held in March 1960."

V. MATHEMATICS

53. Approximation Method for Solving Boundary Value Problems

"Numerical-Graphical Method of Solving Boundary Value Problems for Ordinary Differential Equations of the Second Order," by A. G. Anisimov, Zoporozh'ye Machine Building Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 5 (12), Sep/Oct 59, pp 40-47

One of the most extended and general methods for the numerical solution of differential equations with the boundary conditions (linear boundary conditions (linear boundary value problems)

$$\left.\begin{aligned} Ly &= y'' + \varphi(x)\, y = f(x), \\ y(x_0) &= y_0, \quad y(x_n) = y_n, \end{aligned}\right\} \qquad (1)$$

y_0, y_n given numbers, is the reduction of such problems to the numerical solution of several Cauchy problems (L. Kollatts, Chislennyye metody resheniya differentsial'nykh uravneniy (Numerical Methods of Solving Differential Equations), Moscow, 1953, p 96).

Or, using one of the formulas of quadratures, for example,

$$\frac{1}{h^2}\delta^2 y_i = \frac{1}{12} D(y_i'') - \frac{h^4}{240} y^{VI}(\Theta_i) \quad . \quad (x_{i-1} < \Theta_i < x_{i+1})$$

without the remainder term $R_i = \frac{h^4}{240} y^{VI}(\Theta_i)$, where $y_i = y(x_i)$

$y_i'' = y''(x_i)$, $x_i = x_0 + ih$ $(i = 0, 1, \ldots, n)$, $D(y_i'') = y_{i-1}'' + 10\, y_i'' + y_{i+1}''$, and by the differential equation (1) we are brought to the solution of the system of n-1 linear equations with n-1 unknowns:

$$\left(1 + \frac{h^2}{12}\varphi_{i-1}\right) y_{i-1} - 2\left(1 - \frac{5h^2}{12}\varphi_i\right) y_i + \left(1 + \left(1 + \frac{h^2}{12}\varphi_{i+1}\right) y_{i+1} = \frac{h^2}{12} D(f_i),\right. \tag{2}$$

y_o, y_n given. The system (2) for the conditions $0 < -h^2 \varphi(x) \leq 24$ has a unique solution (Ibid, p 126).

The method proposed by us for the numerical solution of the problem (1) consists of the following: using the recurrent formulas

$$\begin{aligned} \xi_{i+1} &= x_i - (12 + h^2\varphi_{i+1})\cdot F_i, \\ \eta_{i+1} &= \eta_i - h[D(f_i) - \eta_i D(\varphi_i)]\cdot F_i, \quad \text{where} \\ F_i &= \frac{x_i - \xi_i}{(12 + h^2\varphi_{i-1}) - h(x_i - \xi_i) D(\varphi_i)} \end{aligned} \tag{3}$$

and by the condition $y(x_o) = y_o$ (it is assumed that the points S_o and K_o coincide), the coordinates of the auxiliary points $S_1, S_2, \ldots, S_n$ lying respectively on the chords K_oK_1, K_1K_2, . . . , $K_{n-1}K_n$ of the desired integral curve of problem (1), or on the extension of these chords (Figure 1).

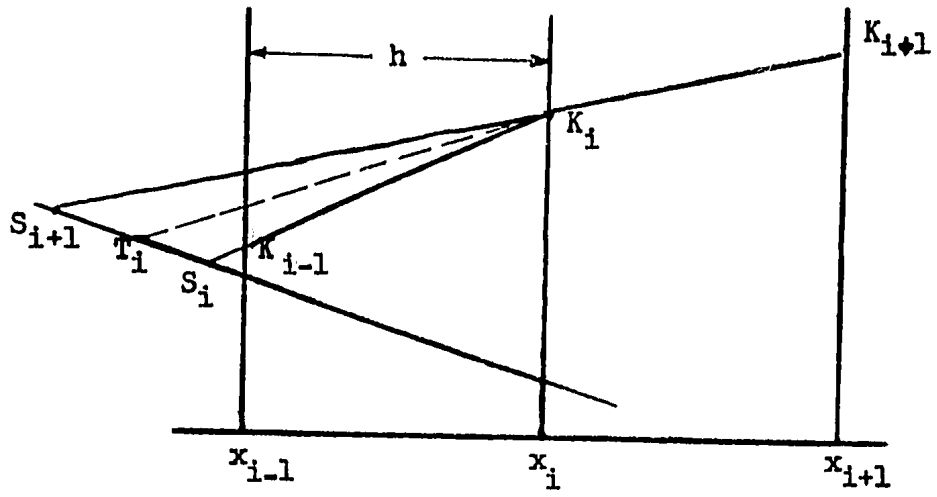


Figure 1

After this, with the help of the recurrent formula

$$y_{i-1} = y_i + \frac{\gamma_i - y_i}{x_i - \xi_i} h \quad (i=\overline{n,n-1,\ldots, 2}),$$ the approximate numerical solution $y_{n-1}, y_{n-2}, \ldots, y_1$ of problem (1) is obtained.

This system may also be applied for the solution of more the general boundary value problem:

$$Ly = f(x); \quad y(x_o) = y_o; \quad y'(x_n) + \beta y(x_n) = \gamma_n \quad (\beta \geq 0). \qquad (4)$$

The finding of solutions for problems (1) and (4) was discussed in detail in the paper.

It was also proved that the purposed method is more exact and effective than the known methods for solving boundary value problems of L. Kollatts (Ibid.) and L. V. Kantorovich, V. I. Krylov, Priblizhennyye metody vysshego analiza (Approximation Methods of Higher Analysis), Moscow-Leningrad, 1950.

54. Complete Aposteriori Distribution

"Concerning a Complete Aposteriori Distribution," by G. P. Boyev, Saratov Gosudarstvennyy University imeni N. G. Chernyshevskiy; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 5 (12), Sep/Oct 59, pp 58-66

Let $F(x, \lambda)$ be the distribution function of the random variable x, depending on the parameter λ. We will consider how this is accomplished as a classical mathematical statistic, the parameter λ being a random variable. If $p(\lambda)$ has an a priori distribution of the parameter λ, then its aposteriori distribution can be represented in the form

$$p_n(x; x_1, \ldots, x_n) = \lim_{\delta \to 0} \frac{p(\lambda)\Delta F(x_1, \lambda) \ldots \Delta F(x_n, \lambda)}{\int_a^b p(\lambda)\Delta F(x_1, \lambda) \ldots \Delta F(x_n, \lambda) d\lambda}$$

where $\Delta F(x_i, \lambda)$ designates $F(x_i + \delta, \lambda) - F(x_i, \lambda)$, (a, b) is the internal of range of λ, and x_i is the observed value of x (see B. V. Gnedenko, Kurs teorii veroyatnostey (Course in the theory of probability), State Publishing House of Technical and Theoretical Literature, 1954).

It is interesting to consider the distribution function under the hypothesis that λ may assume all possible values in the internal (a, b). This leads us to the distribution function

$$F_n(x; x_1, \ldots, x_n) = \int_a^b F(x, \lambda)\, p_n(\lambda; x_1, \ldots, x_n)\, d\lambda ,$$

which is naturally called the complete aposteriori distribution function of the quantity x. It is proved in the article that for known conditions, the sequence of functions $F_n(x; x_1, \ldots, x_n)$ has a limit $F(x, \lambda_*)$ as $n \to \infty$, where λ_* is the value of the parameter maximizing the probability of density of the system $x_1, \ldots, x_n$. As a consequence of this, it is expeditious to consider the function $F_n(x; x_1, \ldots, x_n)$ as an approximate distribution of the quantity x, obtained from the research data $x_1, \ldots, x_n$.

VI. MEDICINE

Bacteriology

55. Modified Komarova Method for Isolating Pure Cultures

"The Isolation of Pure Cultures of Microrganisms (A Modification of the L. T. Komarova Method)," by A. A. Yegorova and Z. I. Derygina, Institute of Microbiology, Academy of Sciences USSR; Moscow, Mikrobiologiya, No 4, Jul/Aug 59, p 611

"The Komarova dilution method (1949) has been used successfully by many investigators to isolate pure cultures of microorganism, which are especially difficult to obtain.

"Komarova suggested a very suitable micropipette which delivers drops with a diameter of 0.1-0.2 mm. With this pipe the, droplets from a suitably diluted bacterial suspension are put on a slide, which is then placed in a culture medium in such a way that one cell falls in each of several drops. In this manner it is possible to obtain a pure culture consisting of a single species of organism. Fifty or more slides, and as many flasks containing culture media in which the slides with the droplets are immersed, are usually employed for preparing pure cultures by this method.

"After incubation, the contents of the flasks are scanned under a microscope; if a pure culture is not observed, the aforementioned operation is repeated. This procedure naturally wastes a great deal of the investigator's time and makes this method cumbersome.

"We suggest a simplification of the method to make it less laborious.

"Our simplification consists of the following steps:

"Drops from the Komarova pipette are placed not on a slide, but on a solid, selective culture medium in a Petri dish. For convenience, the surface of the dish containing the culture medium is divided into squares, or, still better, the dishes are placed on top of stencils marked off in squares. One drop of inoculate from the micropipette is placed on each square. The dishes containing the seedings are kept at a favorable temperature, and after incubation the developed colonies are easily studied under a microscope with various objectives.

"The cultures studied are reseeded with a stylus or a loop on selective liquid or solid culture media.

"It is advantageous to seed the drops on two dishes immediately: there is a better chance of obtaining a pure culture, and the time required for the investigation is shortened.

"We have used this method many times to isolate pure cultures."

Contagious Diseases

56. Hemorrhagic Fever in Belorussia

"Clinical Course of Hemorrhagic Fever in Belorussia," by A. A. Basalayev, Okrug Military Hospital; Minsk, Zdravookhraneniye Belorussii, Vol V, No 9, Sep 59, pp 54-58

The article describes the methods of diagnosis, therapy, and course of three cases of hemorrhagic fever discovered in the Bobruisk area of Belorussia. Clinical observations established three periods in the course of the disease: high temperature and manifestations of high toxicity usually lasting from 3 to 6 days in the first period; renal modifications or manifestations of some degree of the hermorrhagic syndrome in the second period; recovery accompanied by a sharply reduced renal concentration capacity, polyurea, and pathological thirst in the third period which lasts for a number of weeks and on occasions several months. Recommended therapy is the intravenous administration of a hypertonic solution of sodium chloride and the administration of glucose, vitamins, and symptomatic drugs. There are no specific drugs for the therapy of the disease at present. Antibiotics have been found ineffective.

On the basis of his observations, the author thinks that natural foci of hemorrhagic fever exist in the Bobruisk area and advocates an epidemiological study of the area.

Epidemiology

57. B. tularense Isolated From Gamasidic Mites

"Isolation of the Tularemia Pathogen From Laelaps hilatis Mites (Gamasoidea, Parasitiformes)," by Ye. F. Litvinenko, Department of Especially Dangerous Infections, Kiev Basin Sanitary-Epidemiological Station; Moscow, Zoologicheskiy Zhurnal, Vol 38, No 8, Aug 59, p 1260

This article reports the collection of gamasidic mites during a tularemia epizootic among Microtus arvalis Pall. in Zhitomirskaya Oblast in 1955. Only one species, Laelaps (Microlaelaps) hilaris C. L. Koch,

1836; Lange, 1947; Zakhvatkin, 1948, which belongs to the family Laelaptidae Berlese 1892 and the genus Laelaps C. L. Koch, was found in the fields in the spring and summer, and is, in the opinion of A. B. Lange and A. A. Zakhvatkin, specific for Microtus arvalis Pall. and other closely related rodent species such as M. oeconomus, M. agrestis, and M. socialis.

A pure culture of B. tularense was isolated in one case, and the presence of infection was substantiated by biological tests. The absence of other ectoparasites during the epizootic period gave rise to the assumption that B. tularense at the time of harvesting is transmitted via Laelaps hilaris. Further experimental substantiation of this theory is required.

58. Brucella Culture Isolated From Dermacentor pictus Ticks

"Dermacentor pictus Herm. Ticks, Carriers of the Brucellosis Pathogen," by Ye. M. Yemchuk and Ye. F. Glushan; Kiev, Doklady Akademii Nauk Ukrainskiy SSR, No 5, 1959, pp 557-559

This article reports that a culture of Brucella abortus bovis was isolated by inoculating liquid and solid culture media with a suspension of Dermacentor pictus ticks which had been removed from cattle. Six strains were isolated (three from half-nourished females, two from larvae, and one from eggs). The larvae and eggs were obtained from females which had fed on diseased animals. Brucella from the infected females passes into the eggs and larvae during the process of development.

The transovarial transmission of the brucellosis pathogen by D. pictus Herm. ticks was thus established.

59. Q Fever in Poland

Investigation of Q Fever in Cattle in Northeastern Provinces of Poland With the Aid of the Capillary Agglutination Test With Milk," by R. Tworek and D. Serkowa Krakow, Przeglad Epidemiologiczny, Vol 8, No 3, 1959, pp 273-275

In the three northeastern provinces of Poland, 9,558 cows belonging to 219 herds have been examined for infection with R. burneti by the Luoto method (the capillary agglutination test with milk). Negative results were obtained in all cases. Consequently, the article states, it can be assumed that there are no enzootic foci of Q fever in these provinces.

60. Yugoslav Physician Concludes Causes of Pernicious Anemia and Leukemia To Be Analogous

"What Causes Leukemia?" by Z. P., Zagreb, Vjesnik, 25 Oct 59, p 8

Dr Cedomil Vugrincic, Chief of the Internal Division of the General Hospital in Osijek, is engaged in research on the causes of leukemia. During his studies on diabetes, he noted certain recurrent regulatory laws in individual organisms. A particularly general rule is that the decomposition products which result during a process are the chief regulator in the supply of raw materials necessary for continuation of the process. Analyzing the validity of this law in hermatology, Dr Vugrincic confirmed the fact that stimulation of the hemopoietic apparatus by the products of the decomposition of blood corpuscles is of greater significance than clinicians have heretofore believed. Numerous clinical and experimental observations have shown that an increased decomposition of blood corpuscles directly stimulates a more intensive formation of new corpuscles. In this way, nature ensures that every lost corpuscle will automatically be replaced by the abundant formation of new ones.

Dr. Vugrincic then posed the question of what importance this regulatory method has in those diseases of the blood which are caused by a lack of maturation factors. The classical disease of this type is pernicious anemia caused by a lack of vitamin B_{12}. Next, Dr Vugrincic asked whether there is any analogous disease affecting the white blood corpuscle. Analyzing systematically all known diseases, he concluded that leukemia is a pathological condition, for the most part caused by a deficiency of certain substances in the body.

To prove these assumptions, experiments on the culturing of white blood corpuscles were conducted. While others have chiefly studied only differences in the behavior of leucocytes from healthy persons and leukemia patients in the same medium, Dr Vugrincic studied the behavior of leucocytes, both healthy and diseased, in the blood of a normal person and that of one ill with leukemia. He noted that the development of the leucocytes in the blood of a healthy person was considerably faster and more regular and that they were destroyed to a much lesser extent than those cultured in the serum of a person with leukemia. The experiments have convincingly shown that this difference in development is conditioned by the lack of some substance which is necessary for the maturation of leucocytes in the blood of a person with leukemia.

Oncology

61. Osteogenic Sarcoma Induced by Radioisotopes

"On Some Regularities of the Development of Osteogenic Sarcomas Induced by Radioisotopes," by V.N. Strel'tsova, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 8, 1959, pp 131-140

Sr^{90}, Sr^{89}, Sr^{89}+Sr^{90}, Y^{90}, Y^{91}, Ba^{140}, Pu^{239}, Ce^{144}, Pm^{147}, and fresh or stored solutions of the products of uranium fission were administered to rats in doses of 0.005-3.0 microcuries, and to rabbits in doses of 0.2-1.5 microcuries. Investigations of the animals which survived for more than 200 days disclosed that osteosarcoma was induced by the radioisotopes. The investigations also showed that the frequency with which osteosarcoma developed in the animals depended on the quantity of the isotope administered to the animals; the sex of the animal had no bearing on the frequency of the development of the diseases; and a decisive factor in the development of osteosarcoma was the quantity of the isotope which penetrated the bone tissue.

62. Cancer Research

"Cancer Must Be Conquered" (unsigned article); Prague, Obrana Lidu, 20 Sep 59, p 6

An article quoting Prof N. Blokhin, a Corresponding Member of the Academy of Medical Sciences USSR and vice-president of the International Union Against Cancer, to the effect that cancer research is being carried on in many Oncological Institutes in the USSR is presented. Administratively, the research program is coordinated by a special commission of the Academy of Medical Sciences USSR headed by A. N. Bakulev, its president. Some 49.2 percent of all the patients who registered at the Oncological Institutions of the USSR for treatment have recovered. Most of these cases, however, suffered from cancer of the skin, which is now 95 percent curable. A program of mass examinations has been inaugurated in the USSR with about 90 million persons being examined each year. As a result, the number of neglected cases of cancer has been reduced considerably.

Pharmacology and Toxicology

63. Cholinesterase Activity in the Blood and Tissues

"Rapid Method of the Determination of Cholinesterase Activity in the Blood and Tissues," by A. Jasinski, Institute of General and Experimental Pathology, Lublin: Warsaw, Acta Physiologica Polonica, Vol X, No 5, Sep Oct 59, pp 647-650

A description of a rapid and accurate method of the potentiometric micromethod for the determination of cholinesterase activity in the blood (plasma and erythrocytes) and tissues is given. The method requires the use of either 0.02 milliliter of blood or 0.5 gram of tissue. The principle is based on the titration of the acetic acid, which is liberated during the process of incubation of the studied material with acetylcholine hydrochloride, with 0.01 n sodium hydroxide. Titration is carried out with the help of a pH meter and a microburette designed by the author. The sensitivity of the method is 0.03 μEq (3 % error) with a pH meter of average sensitivity.

64. Reactions Induced by Conditioned Reflex Intoxications

"Cholinergic Reaction and Chlinesterase Activity in Certain Conditioned Reflex Intoxications," by V.P.Kolodiy, Tr. po Vopr. Patologii (Works on Problems in Pathology), 1958, 161-165 (from Referativnyy Zhurnal Khimiya, Biologicheskaya Khimiya, No 19, 10 Oct 59, Abstract No 26233, by N. Fruyentov)

"The possibility of developing TCR (toxic conditioned reflex reactions) to pilocarpine (5-7 milligrams), carboxylene (0.2 milligram), and proserine (2-4 milligrams in dogs has been noted. Under the influence of TCR, the content of acetylcholine in the blood considerably increased, and in some cases the activity of the cholinesterase in the blood was somewhat enhanced (total of erythrocytes and plasma). The author came to the conclusion that the conditioned reflex mechanism plays a part in the origin of intoxications by the studied substances."

65. New Sedatives Acting On Central Nervous System

"Esters of 3,4,5-Trimethylgallic Acid and γ-Aminopropanols. Substances Exibiting Sedative Action of the Central Nervous System," by J. Supniewski, K. Bednarz, and J. Krupinska, Dissert. pharmac. PAN, 1958, 10, No 3, 191-211 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 18, 25 Sep 59, Abstract No 24871 by M. Zabolotskaya)

"A sedative effect on the central nervous system of white mice was produced by the hydrochlorides of esters of γ-N-diethylaminopropanol, γ-N-piperidinepropanol γ-N-morpholinepropanol with 3,4,5-trimethylgallic acid. The most active of these substances was the morpholine derivative. By subcutaneous injection the LD_{50} for mice of the diethylamine and piperidine derivative was determined at 200 mg/kg (but for the morpholine derivative at 1,500 mg/kg). The intravenously administered lethal dose for cats was 30 mg/kg for the piperidine derivative and 40 mg/kg for the morpholine derivative. At a dose of 50 mg/kg introduced subcutaneously, all the compounds exhibited a sedative effect and prolonged evipal-caused anesthesia in mice. The hypotensive action of all the compounds was weakly expressed."

66. Mutomycin-- New Antibiotic

"Mutomycin, a New Antibiotic Derived From Actinomyces atrcolivaceous," by G. F. Gauze, T.S. Maksimova, O. L. Popova, M. G. Brazhnikova, T. A. Uspenskaya, O.K.Rossolimo, Institute for the Search of New Antibiotics; Moscow, Antibiotiki, Vol VI, No 3, May Jun 59, pp 20-23

Mutomycin is a new antibiotic obtained from Actinomyces atrcolivaceous. It is composed of C -- 65.48 percent, H -- 9.05 percent, and O -- 25.47 percent. Its assumed empirical formula is $C_7H_{11-12}O_2$. Mutomycin is a white crystalline powder; it is insoluble in water and ether as well as in 5-percent solutions of sodium hydroxide and hydrochloric acid. It is readily soluble in ethyl alcohol and acetone. Mutomycin has been found to have selective inhibiting effect on staphylococci mutants with oxidation deficiency. It is nontoxic and has a slightly inhibiting effect on the development of Ehrlich's sarcoma in mice.

67. Violarin-- New Antibiotic

"The Derivation and Properties of Violarin-- an Antiviral Antibiotic," by D. M. Trakhtenberg, L.V.Cherenkova, and A. S. Khokhlov, All-Union Scientific Research Institute of Antibiotics; Moscow, Antibiotiki, Vol IV, No 5, Sep Oct 59, pp 7-11

A report on the methods of derivation and chemical purification, and the properties of violarin, an antibiotic isolated from the cultural liquid of the strains of Actinomyces violaceus 12-12 and 452/7 (the group of blue-violet actinomycetes), is presented. Violarin is insoluble in water and petroleum ether and slightly soluble in carbon tetrachloride; it is more readily soluble in methyl and ethyl alcohols and is readily soluble in benzene, chloroform, n-butyl alcohol, formamide, dimethyl formamide, and in acetic, hydrochloric, and sulfuric acids. Violarin was found to be antibacterially active in experiments in vitro, and antiviral against the influenza virus in vivo and the smallpox vaccine in vivo and in vitro. It was found ineffective in the therapy of pneumococci and staphylococci infections in mice. On the basis of analytical data now available, the empirical formula $C_{22-24}H_{32.34}O_{8-9}$ has been assumed for the antibiotic.

68. Antibiotic 6613

"Formation of 6613, an Antibiotic, in Cultures of Actinomyces daghestanicus," by Ye. G. Toropova, G.V.Gavrilina, S. A. Lirova, and K. K. Ivanov, Institute for the Search of New Antibiotics Academy of Medical Sciences USSR; Moscow, Antibiotiki, Vol IV, No 5, Sep Oct 59, pp 11-14

A description of the method of deriving 6613, a new antibiotic isolated from a new species of Actinomyces daghestanicus. The 6613 was found to have a selectively depressing effect on the growth of gram positive bacteria, and acts chemotherapeutically when administered orally to mice infected with pathogenic cultures of staphylococci and streptococci. When in pure crystalline form, it is a polypeptide. In its chemical properties, it is close to the antibiotics known as etamycin and viridogrisein.

69. Antibiotic Therapy of Gas Gangrene

"Application of Tetracyclines in Experimental Gas Gangrene," by V. R. Sobolev and A. I. Braude, Chair of Microbiology and Laboratory of New Antibiotics, Central Institute for the Advance Training of Physicians; Moscow, Antibiotiki, Vol IV, No 5, Sep Oct 59, pp 52-58

A study was made of the therapeutic effectiveness of antibiotics of the tetracycline series -- chlortetracycline, oxytetracycline, and tetracycline--when used in the therapy of experimental gangrene induced by

Bacterium perfringens, Bacterium sordelli, and Vibrion septique. Gas gangrene is one of the most severe complications of wounds, especially wounds inflicted in wartime. During World War II, the mortality rate from gas gangrene was very high despite improved surgical techniques and the application of sulfanimides and antigangrene sera. The experiments were conducted on white mice. The animals were infected with lethal doses of the three gas gangrene pathogens mentioned above. The antibiotics were administered to the animals orally and intramuscularly. The peroral administration of the antibiotics at the same time the animals were infected produced good results; poor results were obtained when the antibiotics were applied 2 hours after the infection. The intramuscular administration of the antibiotics simultaneously with the infection of the animals produced 100-percent survival in the mice. Best results were obtained with tetracycline.

70. Effect of Antibiotics on Bacillus coli

"Sensitivity of Pathogenic Serotypes of Bacillus coli to Different Antibiotics," by Li Chu'ng, Chair of Microbiology, Leningrad Pediatric Medical Institute; Moscow, Pediatriya, Vol 37, No 9, Sep 59, pp 65-68

Investigations were conducted to determine the comparative effect of various antibiotics (streptomycin, biomycin, synthomycin, and terramycin) on pathogenic strains of Bacillus coli of different serological groups. In all, 295 strains of Bacillus coli were studied: 100 of these belonged to group O111; 70 to group 055; and 25 to group 026. The remaining 100 strains were not grouped. The investigations established that streptomycin, biomycin, and synthomycin have only a slight antibiotic effect on the bacilli of groups O111 and 055; their effect on the bacilli of group 026 was somewhat greater; terramycin was the more effective of the antibiotics in regard to bacilli of group 026; and all the Bacillus coli strains tested were resistant to penicillin.

71. Sensitivity of the Causative Agent of Listerellosis to Antibiotics in Vitro

"Investigation of the Sensitivity of the Causative Agent of Listerellosis in Farm Animals to Different Antibiotics in Vitro," by I. A. Bukulov, Chair of Epizootology, Moscow Veterinary Academy; Moscow, Antibiotiki, Vol IV, No V, Sep Oct 59, pp 62-65

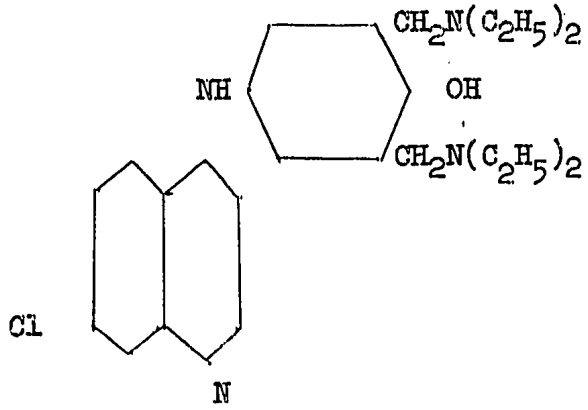
Studies were conducted in vitro on the sensitivity of 12 strains of the causative agent of listerellosis in farm animals to a number of antibiotics. The investigations established that chlortetracycline is bacteriostatic in relation to listeria when used concentrations of 0.05-0.3

units per milliliter; oxytetracycline, when used in concentrations of 0.45-0.3 units per milliliter; stetracycline, in concentration of 0.9 unit per milliliter; streptomycin, in concentrations of 6.25-25.0 units per milliliter; penicillin, in concentrations of 0.3-0.9 units per milliliter; ecmoline, in concentrations of 62.5 - 125 units per milliliter; that chlortetracycline and ecmoline when in combination have a synergetic action; that listeria are highly sensitive to large doses of chlortetracycline and oxytetracycline.

72. Cycloquine -- Antimalarial Preparation

"Data on the Tolerance of Cycloquine, an Antimalarial Preparation, by Laboratory Animals," by V. F. Gladkikh, O. I. Kellina, and Yu. V. Korogodina, Institute of Malaria, Medical Parasitology, and Helmintology, Ministry of Health USSR; Moscow, Meditsinskaya Parazitologiya i Parazitarnyye Bolezni, Vol XXVIII, No 4, Jul/Aug 59, pp 443-448

Mice, rats, and rabbits were used in experiments which were conducted to determine the tolerance of laboratory animals to cycloquine, a preparation used in the therapy of malaria. Cycloquine is a derivative of 4-amino-quinoline and is a 7-chloro-4/3',5'-bis (diethyl-aminoethyl)-4 oxyphenyl/-amino-quinoline. It was synthesized by the chemical division of the institute and has the following structural formula:



Cycloquine is crystalline, yellow in color, and has a bitter taste. Its melting point is 162-163 degrees. It is readily soluble in benzene, acetone, alcohol, and ether. It is insoluble in water, and dissolved with difficulty on petroleum ether. When prepared for internal administration it is first dissolved in a small quantity of HCl, and enough distilled water is added to the solution until the desired quantity is obtained. The experiments established that the animals tolerated cycloquine well and that it has no cumulative action. Some of the rats developed some side reactions which were not lasting.

73. New Cholagogues

"New Cholagogues Which Decrease the Cholesterine Level in the Blood," by Jan Venulet, Wiadom. Lekar, 1957, 10, No 19, 895-896 (from Referativnyy Zhurnal--Biologiya, No 20, 25 Oct 59, Abstract No 90912, by Ya. A. Snegirev)

"A brief survey of data is presented on the following new cholagogues: vanilone, p-oxyphenylsalicylamide (driol), 1-methoxy-4-naphtoil propionic acid (ikteril), phenylethylacetamide (hyposterol), and phenylethyl acetic acid. All these drugs reduce the level of cholesterine in the blood. The positive effect of the utilization of heparin, inhalation of O_2, and of the brief lasting action of thyroxin and related compounds has been noted."

74. New Medicinal Preparations

"New Medicinal Preparations," by A. Podlewska and J. Podlewska, Farmac. Polska (Pharmacology of Poland), 1958, 14, No 22, 383-384 (from Referativnyy Zhurnal-Khimiya, No 19, 10 Oct 59, Abstract No 68745, by V. Ivanova)

"Brief information is given on the composition, application, and effect of the following new drugs: amphenone B-/the hydrochloride of 3,3-bis-(para-paminophenyl)-2-butanone/, a drug which depresses the functions of the suprarenal and thyroid glands cortices and when intravascularly administered acts as an anesthetic; progresin, a mixture of magnesium salts of dehydrocholine and nicotinic acid, a drug which acts as a sedative on the central nervous system, decreases the tonus of the smooth muscles and the secretion of cholesterase; sodium thiomerin (Diucardin, Mercaptomerin sodium -- the di-Na salt of N-(gamma-carboxymethylmercaptothio-beta-methoxy)-propyl, (camphor-amido acid) -- a drug which acts as a diuretic; obron and viterra--vitamin preparations; Calcium disodium versenate (Calsol, ethylene diamine tetracetic acid, 1); edathamil calcium di-Na (Mosatil, the sodium-calcium salt of 1); calcium silvestren, the calcium di-Na salt of 1, a drug used in cases of tin intoxication."

75. Prophylaxis of Motion Sickness

"New Drug Against Motion Sickness" (unsigned article); Moscow, Technika Molodezhi, Vol 27, No 5, May 59, p 40

"Many people suffer from motion sickness not only when on the sea or in a plane, but also when riding in autobuses and even in streetcars. "Aeron," a well-known drug, either helps them very little or not at all. Laboratory workers of the Chair of Pharmacology at the Dnepropetrovsk Medical Institute, after prolonged investigations, determined that a

mixture containing 0.005 gram of platyphilline bitartrate, 0.15 gram of caffeine sodium benzoate, and 0.15 gram of sodium bromide is highly effective against motion sickness. The mixture may be taken in the form of a powder, tablets, drops, or in gelatine capsules. It is taken half an hour before embarking on a journey and repeated 3-5 hours later during the journey. Tablets of the drug are now being manufactured at the plant of the Dnepropetrovsk Pharmacy Administration."

76. Effect of Xanthoprotein on Tumors

"Effect of Xanthoprotein on the Metabolism of Tumors," by B. Sobczuk, Postepy Biochem (Poland), 1958, 4, No 1, 107-119 (from Referativnyy Zhurnal--Biologiya, No 20, 25 Oct 59, Abstract No 90446, S. Ya. Marmorshteyn)

"Rabbits and mice with Brown-Pearce, Ehrlich, and Crocker tumors intravenously received daily solutions of xanthoprotein (I; one milligram per milliliter); porphyropterine (II; 0.3 milligram per milliliter); or the dye obtained in the process of the synthesis of (I). The rabbits reveived doses of 10 milliliters per kilogram of body weight, and the mice, 0.3 milliliter per kilogram of body weight. (I) accelerated the growth of the Ehrlich and Crocker tumors, while (II) inhibited their growth. The growth of Ehrlich's tumors was retarded by both preparations. The administration of (I) increased the number of erythrocytes, leukocytes, and reticulocytes, while the administration of (II) increased the number of leukocytes only. The addition of (I) and (II) reduced the absorption of O_2 by the healthy tissues; their addition to tumorous tissue led to an increase in the absorption of O_2 in the bicarbonate buffer, and a diminution of the absorption of O_2 in the phosphate buffer. These differences indicate an influence of the substances studied on the respiratory enzymes of the tissues, presumably on the xanthoxydaze."

77. Antivomiting Action of Aminazine and Propazine

"On the Problem of the Antivomiting Action of Aminazine and Propazine," by V. V. Ivanova, Obstetrical-Gynecological Clinic, Therapeutic Faculty, Saratov Medical Institute; Moscow, Farmakologiya i Toksikologiya, Vol XXII, No 5, Sep/Oct 59, pp 397-400

Cats were used in experiments carried out to determine the effectiveness of aminazine and propazine when used to counteract substances which induce vomiting. Vomiting was induced in the animals by the administration of apomorphine and copper sulfate. The experiments established that both preparations have a definite antivomiting action. Aminazine administered intramuscularly and orally in a dose of 3 milligrams per

kilogram of body weight 30 minutes, and propazine in a dose of 3 milligrams per kilogram of body weight one hour before the administration of 25 milligrams per kilogram of body weight of apomorphine and 25 milligrams per kilogram of body weight of copper sulfate prevented vomiting in the experimental animals.

78. Pharmacology of Hexatonide

"Experimental Investigation of the Pharmacology of 1,6-Hexamethylene-bis-trimethyl Ammonium Diiodide (Hexatonite)," by V. V. Stankevich, Tr. Krymsk. Med. In-ta (Works of the Crimean Medical Institute), 1957, 17, 171-176 (from Referativnyy Zhurnal--Biologiya, No 20, 25 Oct 59, Abstract No 90847, by Ye. S. Ravskaya)

"Studies were conducted of the effect of hexatonide on the neurocholinoreactive systems of the automatic ganglia (on the basis of the reactions of blood pressure and the reaction of the nictitating membrane), and on the pressor reactions which develop as a result of the pressure applied to the common carotid artery and the stimulation of the sciatic nerve. The intravenous administration of hexatonide in doses of 0.1-3 milligrams per kilogram of body weight to cats produced lower arterial pressure and blocked the transmission of impulses to the sympathetic and parasympathetic ganglia. The experiments established that the cardiac ganglia of the vagus nerve were the most sensitive to the action of hexatonide; next in sensitivity were the splanchnik ganglia followed by the superior cervical sympathetic ganglion. Hexatonide (3-5 milligrams per kilogram of body weight) had no effect on the muscular cholino- and adreno-reactive systems of rabbits. In doses of 0.25-3 milligrams per kilogram of body weight, it depressed and diminished the pressor reactions caused by pressure applied to the common carotid artery and by the electrical irritation of the central terminal of the sciatic nerve."

Physiology

79. Effects of Pure Oxygen

"Gas Exchange During Oxygen Respiration," by G. N. Zilov, Chair of Normal Physiology, First Moscow Medical Institute imeni I. M. Sechenov; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, No 8, Aug 59, pp 12-17

The author of this article discusses the results of 200 experiments conducted on 45 rats to determine gas exchange during the inhalation of almost pure oxygen. The carbon dioxide liberated by these animals during a definite time interval served as a criterion for gas exchange intensity.

This method made it possible to determine the dynamics of the carbon dioxide liberation and to make relevant comparisons before and after oxygen inhalation as well as during the period of its so-called aftereffect. Judging by the amount of carbon dioxide liberated, the gas exchange decreased by more than 20% in two of the experiments in which the animals inhaled almost pure oxygen. The increase in the output of carbon dioxide lasted not more than 1½ hours during the period of aftereffect.

Results of experiments showed that the gas exchange in rats tends to rise when they inhale almost pure oxygen for a period of 3-4 hours. This is associated with the stimulating effect of the oxygen on the respiratory tract.

80. Role of Neocortex in Behavior of Cats

"The Role That the Neocortex Plays in the Emotional Reactions of a Cat," by Ts. A. Ordzhonikidze and M. A. Nutsubidze, Institute of Physiology, Academy of Sciences Georgian SSR; Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 23, No 2, Aug 59, pp 187-192

The author of this article states that the results of observations of the behavior of four normal cats and four cats without a neocortex revealed that the neocortex inhibits the innate emotional response, is involved in the manifestation of positive emotions, and helps preserve individually acquired emotional reactions. It was observed that the innate emotional "rage" reactions are manifested more intensely in cats without a neocortex at the beginning of repeated application of irritations. Individually acquired emotional "fear" reactions developed before surgery disappear after the neocortex is removed. The speed and intensity of manifestation of individually acquired emotional "fear" reactions differ little in cats without a neocortex from those in normal cats. Positive emotional reactions of playing with objects (reactions connected with food procurement) are observed only slightly in cats without a neocortex.

81. Interoceptive Reflexes Studied in Dogs

"Interoceptive Reflexes Under Conditions of High Environmental Temperature and Dehydration of the Organism," by R. M. Kariyeva, Tashkent State Medical Institute; Tashkent, Izvestiya Akademii Nauk Uzbekskoy SSR, No 4, Jul/Aug 59, pp 18-22

Irritation of the mechanoreceptors of the stomach and rectum produces specific reflex changes in the function of the cardiovascular system. These changes are effected through the centers that regulate the function of the heart and the blood vessels. The interrelationship of these centers

undergoes changes when an organism is subjected to dehydration and exposure to radiation. This results in changes in the response mechanism. These observations were based on data obtained as result of 200 experiments on dogs.

82. Book on Internal Inhibition Reviewed

"Vnutrenneye Tormozheniye kak Problema Fiziologii (Internal Inhibition as a Problem of Physiology), by P. K. Anokhin reviewed by Prof P. Makarov; Moscow, Meditsinskiy Rabotnik, No 54 (1802), 7 Jul 59, p 4

The author of this article states that the study of inhibition has been given high priority in research on the physiology of the living organism. Special conferences, symposiums, and colloquiums have been held for some time on the subject of inhibition. The great interest that the book Vnutrenneye Tormozheniye kak Problema Fiziologii (Internal Inhibition as a Problem in Physiology) evoked among Soviet physiologists is, therefore, quite understandable, according to this reviewer. The book was written by one of I. P. Pavlov's pupils, P. K. Anokhin, Active Member of the Academy of Sciences USSR. This book is rated highly by many specialists.

P. K. Anokhin presents the opinions of I. P. Pavlov on the subject of inhibition in general, and internal inhibition in particular. He compares the views of I. P. Pavlov and N. Ye. Vvedenskiy and attempts to summarize available data on physiology in general, especially on inhibition. The tendency of the author of the book to connect the results of investigations with such practical problems as education and the origin of neurosis is significant.

P. K. Anokhin concentrates his attention mainly on internal inhibition. He states that in its emergence, internal inhibition can be extinguishable, differential, or conditioned; somnolent inhibition is examined separately.

I. P. Pavlov showed that a conditioned reflex fades away if it is not reinforced. He claimed that internal inhibition causes a conditioned reflex to fade away. P. K. Anokhin points out that the extinction of a conditioned reflex, as shown by investigations conducted by Pavlov's laboratory, reveals little. The nature of inhibition was not shown by these investigations. Anokhin proposes his own theory concerning the mechanism of the transition of excitation into inhibition. His viewpoint is that the collision of many functions and excitations takes place when conditions are normal. Inhibition develops when excitations become delayed in transit and remain stagnant within a narrow area, creating a block. Biophysical investigations showed that excitation represents depolarization; inhibition represents "hyperpolarization."

It seems to the reader of Anokhin's book that his opinion does not differ much from P. S. Kupalov's opinion. Kupalov's argument is that there is no basic difference between external and internal inhibitions. A dispute between these two representatives of the Pavlovian school seems to be superfluous, because there is sufficient ground for agreement on this question. Anokhin also criticizes the views of F. P. Mayorov and E. A. Astratyan, who regard inhibition as the reduction of excitation.

Makarov states that the book is written in a clear and interesting manner, but that the author must be reproached for a certain measure of anthropomorphism. The part of the book which offers instruction for pedagogues and neuropathologists is significant. However, it is hardly possible to lay a foundation for the physiological principles of education while physiologists are still developing theories about the nature of inhibition.

Anokhin apparently draws an analogy between the conflict of functions and the conflict of excitations. Is the conflict of functions, which include complex processes of excitation and inhibition as well as shifts in excitation and competence, identical with the idea of conflict of excitation? Anokhin does not offer an answer to this question.

P. K. Anokhin recognizes that hypotheses are of varying validity. "A hypothesis directs the thought of an investigator from one experiment to another," states Anokhin, "and prevents chaos in the collection of factual material. Take away from a scientist the right to hypothesize and his laboratory will become transformed into a sad temple of dogma in which a scientist will have only one privilege left -- the privilege of strolling over the stony slab of that which is socially acceptable." The appeal with which the author ends his courageous book will no doubt have its effect, in the reviewer's opinion.

Public Health, Hygiene, and Sanitation

83. Allowable Concentrations of Toxic Substances in the Air

"New Norms of Allowable Content of Toxic Gases, Vapors, and Dust in the Air of Industrial Premises," by Z. B. Smelyanskiy and I. P. Ulanova (Moscow), Central Institute for the Advanced Training of Physicians; Moscow, Gigiyena Truda i Professionalnyye Zabolevaniya, Vol V, No 3, Sep/Oct 59, pp 7-15

The article lists the toxic gases, vapors, and dusts normally found in industrial premises together with the norms of allowable concentration of these substances in the air of such premises, as established by the Chief State Sanitation Inspector of the USSR on 10 Januray 1959. The norms which have been newly established are maximal, should not be exceeded,

and are obligatory for all industrial plants where materials which liberate such toxic substances into the air are being processed. The new norms differ from those previously established and are the result of studies and investigations which were carried out at the Institute of Labor Hygiene and Occupational Diseases Academy of Medical Sciences USSR; the Leningrad, Gor'kiy, Kiev, Kharkov, and Sverdlovsk Institutes of Labor Hygiene and Occupational Diseases; Novosibirsk Institute of Hygiene; Chairs of Labor Hygiene; First Moscow Order of Lenin Medical Institute, the Kiev and Tashkent Medical Institutes, and the Central and Kharkov Institutes for the Advanced Training of Physicians; Chair of Public Hygiene of the Central Institute for the Advanced Training of Physicians; Chair of Hygiene of the Moscow Order of Lenin Medical Institute, and others.

84. Instructions on Use of Gas Mask

"How to Use the Gas Mask Correctly," by S. Frolov; Moscow, Sovetskiy Krasnyy Krest, No 4(46), Jul/Aug 59, pp 25-26

"The filter-type gas mask GP-4u has been designed for civilian use. It consists of an antigas canister and a facepiece. An antismoke filter and specially treated activated charcoal are placed inside the canister. Air which is contaminated with various toxic substances, radioactive dust, and bacteria is purified when passing through the filter and activated charcoal.

"The gas masks are made in three sizes and can be worn in three positions: field, ready, and battle. The gas mask is carried in the 'field' position in the absence of an immediate threat of chemical, atomic, or bacteriological attack. In the immediate danger of attack from the air, the gas mask is placed in the 'ready' position. At the command 'gases,' the mask is placed in the 'battle' position, i.e., it is put on.

"The mask is removed after the all clear signal, or independently if the threat of immediate danger has passed.

"Persons up to 55 years old should don the mask in up to 10 seconds; persons over 55, in not more than 14 seconds.

"Training in wearing the mask for extended periods of time is conducted gradually, beginning with 10-15 minute periods, and continuing up to one hour. This training should be done under medical supervision. After this training completed, foot and snowshoe marches are conducted with the gas mask in position. Men should march 5 kilometers in no definite period of time, and women, three kilometers."

85. Review of Book on Health Service in USSR

Organizatsiya Zdravookhraneniya v SSSR (The Organization of Health Service in the USSR), edited by Prof N. A. Vinogradov, reviewed by K. F. Duplenko, N. A. Vasyutinskiy, G. M. Sidorenko, and A. A. Grando; Moscow, Sovetskaya Zdravookhraneniye, No 7, Jul 59, pp 42-45

Reviewers of this manual for physicians and organizers of the health service think that it constitutes a significant contribution to the information available on public health administration and management in the Soviet Union. They are also of the opinion that this two-volume publication expresses well the ideological and theoretical course of medical aid in the USSR and arouses a spirit of pride and Soviet patriotism. This edition, published in 1958, was prepared by a group of authors.

The first volume of the book discusses the most important questions on the theory and history of health service, medical statistical theory and practice, methods of planning and financing health service, and principles of labor legislation. The second volume covers the organization and management of therapeutic and preventive medical service to adults and children, specialized medical care, and sanitary epidemic control work.

The authors of this book accomplished something very valuable in that it can serve not only as a reference for organizers of health service, but also as a manual for all physicians and medical officers of various specialties.

This work filled a need which has existed for some time. However, it must be noted that much related information is dispersed throughout the two volumes, and very little attention is given to the characteristics of the development of health service in the union republics and to the contribution that health services in various union republics have made to medical care throughout the USSR. The authors of the text omitted such important questions as the main duties of managing personnel of oblast and city health departments, duties of chief specialists and chief rayon medical officers, and the function of the Red Cross and Red Crescent Societies; they failed to consider the organizational link between health agencies and did not discuss social insurance and social welfare.

The authors of this book have shown clearly the extent to which V. I. Lenin was interested in the organization of health service and in the development of ideological and political principles, and have pointed out that the Communist Party has always been the guiding light at all stages of the organization of medical and sanitary service to workers and in the development of medical science and medical education. The authors of this

book say the reviewers, failed to mention the obstacles that Soviet medicine has had to overcome with regard to idealistic conceptions of bourgeois medicine. They should have devoted more discussion in the first few chapters to the growth and development of a system of outpatient clinics, to medical district and territorial principle of medical service, and to the participation of the great mass of workers in the development of medical care.

The successful completion of the Seven-Year Plan (1959-1965) will further improve the national economy, science, and culture in the country. An expected sharp increase in the material well-being and living standards of the Soviet people makes it imperative that the second edition of the book bring up to date the accomplishments of preventive medical practice, which is based on the principle of the unity of an organism and its environment.

The principles of planning and financing health service, the principles of medical appraisal of physical condition, and legislation dealing with the administration of health service and the duties of medical workers are presented quite well. They syllabus of medical institutes does not cover these questions, and medical students do not receive any systematic training in this field of knowledge; they must learn it by trial and error only after they enter practice.

There are a few involved sentences in the book, and the authors of various chapters of the book give figures which are not quite in agreement. In mentioning specialized medical care, the authors forget to reveal the leading role played by the field branches of scientific research institutes and scientific medical societies. No information is given on the work of oblast sanitary epidemic control stations and the rights and duties of the chief medical officers of rayon sanitary epidemic control divisions. All these defects must be rectified in the second edition of this two-volume book.

86. Effect of Ionizing Radiation on Organism Sensitivity

"Effect of Ionizing Radiation on the Sensitivity of the Organism to Anticholinesterase Preparations of Prolonged Action," by Yu. I. Lisunkin, Yezhegodnik In-t Eksperiment. Med. AMN SSSR (Yearbook of the Institute of Experimental Medicine, Academy of Medical Sciences USSR), 1957, L., 1958, 457-461 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 19, 10 Oct 59, Abstract No 26330, by Fruyentov)

"The activity of serum cholinesterase is somewhat diminished under the influence of large doses of X irradiation. The decrease is not large (18 percent at a dose of 5,000 r) and is of brief duration; 6 hours after X irradiation, the activity of the serum cholinesterase is restored to normal. Tetraethyl-monothiopyrophosphate (I) subcutaneously administered in a dose of 0.08 milligram per kilogram of body weight decreases serum cholinesterase activity in healthy mice to 54.6 percent, and when administered 60 minutes after X irradiation -- to 34 percent of the initial level. Differences in the activity of the serum cholinesterase in irradiated and healthy mice which received (I) disappeared 6 hours after the X irradiation. Cerebral cholinesterase activity in the mice increased by 22 percent 2 hours after X irradiation. The subcutaneous administration of (I) in a dose of 0.08 milligram per kilogram of body weight decreased cerebral cholinestersae activity by 20 percent. Under the influence of the combined action of (I) and X irradiation, the cerebral cholinesterase activity in mice was higher than normal (by 13.4 Percent), but lower than that produced by X irradiation alone."

87. Penetration of Radioactive Zinc Into the Organism

"Penetration of Radioactive Zinc Through the Integument," by I. T. Tsilyuryk, Kharkov Medical Institute; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, Vol 3, No 5, Sep/Oct 59, pp 29-32

A presentation of date obtained in experiments which were carried out on mice to determine the degree of absorption of radioactive zinc -- Zn^{65} -- by the integument is made. The experiments established that 0.61 percent of radioactive zinc penetrates into the organism during the first 3 hours after the application of the isotope to the skin; 0.93 percent during the next 6 hours after the application of the isotope to the skin; and 1.2 percent in 24 hours after the application of the isotope to the skin. The

radioactive metal is absorbed by the skin with greatest intensity during the first 3 hours after its application. Cleansing of the skin contaminated by the radioisotope should carried out during the first hours after its contact with the metal.

88. Complex Method of Radiation Therapy Proves Effective in Sukhumi Monkeys

"Certain Problems of the Clinical Management and Therapy of Monkeys Suffering From Acute Radiation Sickness," by A. A. Bagdasarov, M. O. Raushenbakh, G. V. Sukyasyan, G. M. Abdullayev, M. N. Novikova, N. Ya. Lagutina, N. L. Samoylina, and G. A. Chernov, Central Order of Lenin Institute of Hematology and Blood Transfusion, Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 4, No 9, Sep 59, pp 17-24

This research is a study of certain problems of the pathogenesis of acute radiation sickness in monkeys and the use of the complex method of therapy developed at the Radiobiological Laboratory of the Central Institute of Hematology and Blood Transfusion. The work was conducted at the Institute of Experimental Pathology and Therapy, Academy of Medical Sciences USSR, in Sukhumi.

Tests were performed on eight monkeys (adult macaca rhesus) subjected to a single whole-body X irradiation by 540 r. The authors describe the measures for combating various symptoms such as severe toxicosis, hemorrhages, anemia, infections, disturbed blood coagulation, etc. by means of polyvinylpyrrolidone (intravenous administration of 10 ml/kg one day after irradiation), by the intramuscular administration of a 2% solution of promedol, and by the introduction of novocain, whole blood, thrombocyte mass, erythrocyte mass, calcium chloride, vitamins, antibiotics, colloidal infusion, etc.

The use of the complex method of treating acute radiation sickness of monkeys proved to have a definite therapeutic effect: all untreated control monkeys died within the first 2 weeks; all the treated monkeys survived. According to the results of blood studies, the treated monkeys proved to be completely healthy on the 40th day after their irradiation.

89. Protective Agent Against Ionizing Radiation

"Radioprotective Action of AET (S, 2-Aminoethylenethiouronyl) in Combination With Chlorpromazine and Chlorazole," by O. Costachel, Gh. Furnica, O. Popovici, and M. Furnica, Studii cercetari Biochme. Acad. RPR (Rumania), 1958, 1, No 4, 341-354 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 18, 25 Sep 59, Abstract No 24982, by the authors)

"Experiments carried out on rats established that the protective action of AET against ionizing radiation is increased when it is used in conjunction with chlorpromazine and alpha-chlorazole. The effectiveness of its action is expressed more strongly in cases of irradiation with large doses (1,400 Roentgens) than with smaller doses (500 - 1,000 Roentgens)."

90. Radiation Protection of N_2O Anesthesia

"The Effect of Nitrous Oxide Anesthesia on the Life Duration of of Mice After X Irradiation," by L. Tkadlecek, Ceskosl. Fisiol, (Czechoslovak Physiology) Vol 6, No 4, 1957, pp 494-500 (from Referativnyy Zhurnal--Biologiya, No 17, 10 Sep 59, Abstract No 77233, by L. F. Semenov)

A total of 204 mice were irradiated in glass chambers in which the necessary concentration of a gas mixture was maintained. A dose of 700 r proved lethal to all the mice irradiated in ordinary atmosphere gas mixture. A 93% N_2O concentration supplied during irradiation by doses of 900-1,100 r was protective (10-79% survival depending on the doses), but it exerted little effect (5.5% survival) against a dose of 1,300 r. The use of N_2O after irradiation did not alleviate radiation damages, nor did it cause the condition of the mice to deteriorate. Experience gained by changing the oxygen concentration (7-10%) in the mixture containing the N_2O, and by the substitution of inert N_2 gas for N_2O in various experimental series, confirms the fact that the antiradiation protection of N_2O is connected not with its anesthetic effect, but with the accompanying anoxia.

91. Brain Development in X Irradiated Animals

"Brain Development of Animals X Irradiated at Early Stages of Extrauterine Life," by Ye. N. Kosmarskaya, and Yu. I. Barashnev, Laboratory of Brain Development Study, Institute of Pediatrics of of the Academy of Medical Sciences USSR; Moscow, Pediatriya, No 11, Nov 59, pp 33-37

The purpose of this research was to study the characteristics of the development of brains subjected to the effect of harmful factors.

Research conducted on 1-32-day-old rats which were subjected to a single whole-body irradiation by 250 and 500 r indicated that the experimental animals grow not only with immature receptors, closed eyes, and closed external auditory canals, but also with immature brains. In rats irradiated during the first 14 days of their extrauterine life, brain capillary growth ceases 1-1½ months sooner than in the control animals.

The authors conclude that comparison of the effects of X irradiation by 250 and 500 r showed that the higher dose produces greater disturbance in brain development. With the same dose, the younger the animal, the greater the brain injury.

92. Growing Animals Prove Highly Sensitive to Ionizing Radiation

"Characteristics of the Reaction of Growing Organisms to the Effect of X Rays Under Experimental Conditions," by K. A. Moskavecha, Institute of Pediatrics, Academy of Medical Sciences USSR, and the Roentgenotherapeutic Division, Scientific Research Institute of Roentgenology and Radiology; Moscow, Pediatriya, No 11, Nov 59, pp 38-41

This article reports a study of the characteristics of local and general reactions of immature animals subjected to X irradiation. The author studied local and general reactions to irradiation by a single and by repeated doses ranging from 50 to 8,000 r; functional changes in the reticuloendothelial system; morphological changes in the organs and tissues after irradiation; and the lethality of a dose depanding on its intensity.

Various reactions of mice, rats, and rabbits with regard to behavior, appetite, hair and ear development, intestinal function, etc. are discussed. Results indicate that age plays a decisive role in determining the time of appearance and severity of radiation symptoms, while weight, and sex exert no essential effects. An exception to age as a factor is the fact that a newborn animal irradiated by large doses of X rays lives significantly longer than an adult animal irradiated by equivalent doses.

The absence of clinically manifested symptoms of radiation sickness in a growing organism at various stages of its growth does not indicate low sensitivity to X rays. Experimental data show that the function of the reticuloendothelial system in animals a few days old which are, subjected to whole-body irradiation by even small doses (10-15 r) is decreased, and dystrophic changes in the cells of organs and tissues appear sooner than in adult animals.

The author concludes that data based on X-ray therapy of children for malignant neoplasms and inflammatory diseases demonstrate that children are highly sensitive to ionizing radiation; symptoms of radiation sickness are sometimes completely absent or poorly expressed in children with tumors although they have been irradiated by large total doses.

93. Liver and Spleen Homogenates of Irradiated Animals Studied

"Electron Microscope Study of Liver and Spleen Homogenates of Animals Subjected to External and Internal Irradiation," by A. I. Polivoda and A. A. Zolotova; Moscow, Meditsinskaya Radiologiya, Vol 4, No 9, Sep 59, pp 39-45

Several investigators have reported the presence of a hemolytic factor in spleen and liver homogenates of irradiated animals. This research is a detailed study of the threadlike formations in the in the homogenates, their minute structure, the dynamics of their accumulation, and the explanation of their link with the hemolytic factor following irradiation.

Tests were conducted on mice and rats subjected to external irradiation by 800 r from gamma rays of Co^{60} and to internal irradiation by alpha rays (equaling 0.2 m^c/kg) from Po^{210}.

The results of these experiments show that the superficial layer of the centrifuged liver homogenate is hemolytically active. Threadlike formations appear due to the effect of irradiation and are in proportion to the development of radiation sickness. Additional pertinent information is presented.

The authors conclude that the denaturation processes which arise in the submicroscopic structures of the cells of organs of irradiated animals arise first of all in the lipid fraction of the animal tissue. The mechanism of these reactions, as shown by B. N. Tarusov, is analogous to the mechanism of chain reactions. The initial reactions which arise in the lipids and which later lead to the destruction of the protein-lipid complexes of animal tissue are accompanied by the denaturation aggregations of fragments of protein-lipid complexes, and by the appearance of the above-described threadlike formations.

94. Certain ECG Changes in Radiation Sickness

"Changes of Certain Indexes in the Electrocardiogram During Acute Radiation Sickness Caused by Beta Radiations and by Roentgen Irradiation (Experimental Research)," by I. N. Bukhalovskiy, Chair of Faculty Therapy, Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 9, Sep 59, pp 24-29

Radiation-induced changes in the electrocardiogram during acute radiation sickness have been erroneously considered by the majority of investigators to appear only during the course of severe damages, thus canceling the diagnostic significance of the ECG. For this purpose, the author conducted experiments on 48 rabbits subjected to a single whole-body Sr^{89} irradiation by doses between 800 and 1,000 r.

The author presents the following conclusions:

Observations of changes in the ECG during acute radiation sickness caused by roentgen radiation and by beta-radiation from P^{32} and Sr^{89} make it possible to assume that the radioactive isotopes, as well as roentgen radiation, cause regular disturbances in the bioelectrical activity of the myocardium.

The changes most frequently noted are a drop in ECG voltage (R and T waves, and the QRS complex), and the deviation or deformation of the S T interval.

These disturbances can be noted not only during severe damages but also in various phases of radiation sickness caused by P^{32}. Radioactive strontium (Sr^{89}), as compared with P^{32}, causes more significant changes in the ECG, and in a number of cases the changes are more marked than those caused by X irradiation.

Surgery

95. Electric Heart Devised

"An Electric Heart," by A. Dlugach, Moscow Sovetskaya Aviatsiya, No, 220 (3390), 18 Sep 59, p 4

The author of this article states that a heart which suddenly stops functioning can now be revived rapidly and effectively by a small portable apparatus which uses direct current. This apparatus, called an "electric heart," not only only restores heart beats, but also controls the rhythm of these beats.

The apparatus was invented by a group of physicians and engineers of the Scientific Research Institute of Experimental Surgical Apparatuses and Instruments. The group included: N. Dzhavadyan, Doctor of Medical Sciences; Engr B. Rostovtsev; A. Daniel'son, Candidate of Medical Sciences; and Senior Engr A. Kovaleva.

This "electric heart" is now being used in various clinics in Moscow. It is expected that it will also be widely used in medical establishments of the Air Forces.

96. New Heart Pump

"New Type Heart Pump" (unsigned article); Prague, Obrana Lidu (Czechoslovakia), 22 Oct 59, p 2

A new simple and highly efficient heart pump which takes the place of the heart during cardiac surgery is described. The new pump eliminates many of the shortcomings of the heart pumps previously used and was designed at the Laboratory of Measuring Instruments of the Slovak Academy of Sciences in cooperation with the Institute of Experimental Medicine by a team headed by J. Bolf, I. Simucovic, and Dr M. Hubek. Between the end of September and early October, the new pump was utilized in eight operations performed by Academician K. Siska and his team of surgeons.

Veterinary Medicine

97. Therapeutic Use of P^{32} in Domestic Fowl Infected With Paratyphoid

"The Effect of Radioactive Phosphorus on the Course of Certain Infectious Diseases of Chickens (Preliminary Data)," by Yu A. Alekperov; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, Seriya Biologicheskikh i Sel'skokhozvaystvennykh Nauk, No 4, 1959, pp 3-9

The effect of radioactive phosphorus on the course of paratyphoid infection in adult white leghorn chickens was studied.

Agglutination reactions, various blook studies, and studies of weight changes, etc., in control domestic fowl infected with paratyphoid infection alone, and in experimental fowl infected with paratyphoid with the subsequent administration of P^{32} showed that radioactive substances can be used to treat infectious (especially chronic) diseases of fowl and agricultural animals.

98. Fish Immunization Against Diseases Recommended

"Electrophoretic Study of the Protein Fraction of the Blood Serum of Immunized Breeding Carp and Their Progeny," by S. F. Zadvorochnov and K. F Sorvachev, Laboratory of Ichthyopathology of the All-Russian Scientific Research Institute of Pond Fisheries, and the Chair of Animal Biochemistry, State Univerity imeni M. V. Lomonosov; Moscow, Biokhimiya, Vol 24, No 5, Sep/Oct 59, pp 811-816

This article presents results of electrophoretic studies of the blood serum proteins of immunized breeding carp and their progeny over a 3-year period (1955-1958) under the industrial conditions of the Angelin Fisheries, Krasnodar region.

Results prove that the artificial vaccination of breeding carp with a virulent virus vaccine not only protects them from "krasnukha" [red diseases, or "Rotseuche" in German, also called infectious dropsy of carps7--the most dangerous disease of pond fishes, but also confers resistance against this disease to the first generation. The rise in gamma globulin in the blood serum of vaccinated breeding carp and of their progeny which have acquired resistance to red disease is brought about, evidently, by the formation of antibodies.

Judging by the results obtained, the authors recommend the vaccination of breeding carp and of other fishes which are susceptible to red disease. The authors also recommend more extensive experimental research on vaccination of breeding fishes against other infectious diseases.

Virology

99. Ornithosis Produced Experimentally by Aerosol Infection

"The Necessary Conditions for Producing Experimental Infection Caused by the Ornithosis Virus," by V. M. Bolotovskiy, Institute of Virology imeni D. I. Ivanovskiy; Moscow, Voprosy Virusologii, Vol 4, No 5, Sep/Oct 59, pp 601-604

The basic conditions on which the production of an aerosol infection in animals depends are examined in this report. These studies were carried out with an IVK-1 chamber. A suspension prepared from pulmonary tissue of white mice which had been infected with an ornithosis-psittacosis virus aerosol (strain B, "Lom", 396, prepared in Switzerland in 1957) was used as virus-containing material. The suspension was prepared on Martenovskiy bouillon; the strains were previously adapted to mouse pulmonary tissue by intranasal infection. The virus titer fluctuated insignificantly: the LD_{50} was equal to 10^{-7} to 10^{-8}.

In the experiments, the animals were placed in special cartridges which kept the virus aerosol from being deposited on the skin. Photographs of the cartridges are included in the article. The amount of air passing through the chamber within a certain period, the temperature and humidity in the chamber, and the rate of movement of the air were all recorded during the experiments.

The specificity of the disease and the death rate of the animals was investigated by examination of smears of vital organs and by histological methods. The results are discussed in detail, and three tables are given to show various indexes observed.

According to the conclusions presented in the article, the following optimum conditions for ornithosis aerosol infection of white mice in the IVK-1 chamber were established: (a) The level of relative humidity of the air should be 85-95%; (b) The respiratory exposure for mice (the time of contact with the aerosol) should be 60 minutes.

The minimum infecting dose was found to be 100 LD_{50}.

100. Experimental Study of Ornithosis Virus

"An Experimental Study of the Ornithosis Virus at Various Stages of Development," by V. D. Neustroyev and V. N. Milyutin; Moscow, Voprosy Virusologii, Vol 4, No 5, Sep/Oct 59, pp 597-600

Observations of the morphological structure of the ornithosis virus in the process of development and the connection of morphological changes with the infectious and toxic properties of the virus are presented in this article. The development of the virus was studied in brain and lung tissue of white mice, in chick embryo yolk sac, and in HeLa cell cultures. In all experiments, the animals, embryos, and tissue cultures were infected with a 10% suspension of yolk sac from chick embryos killed on the 5th-7th day after infection with ornithosis virus. The morphological structure of the virus, its infectivity and toxicity, and the quantity of virus particles in the suspensions used for titration were simultaneously determined. Morphological changes were investigated by a method of luminescent microscopy described earlier by the authors. The virus was found to pass through the same stages of development in all the materials studied.

Results of these observations are discussed. Microphotographs of the virus in brain tissue and in HeLa cells stained with acridine orange are shown, and titer graphs are given. The following conclusions are presented:

"1. The fate of the ornithosis virus in the organs of animals, in chick embryo yolk sac, and in HeLa cell cultures was successfully traced from the time of entrance to the formation of new 'spore' particles.

"2. The formation of the virus occurred approximately twice as fast in the animal organs as in tissue cultures.

"3. The process of cell penetration and the development of the ornithosis virus consists of the following stages: adsorption and implantation, replication, formation of mature forms, and elution from the cells.

"4. The ornithosis virus assumes infectious and toxic properties either at the time or close to the time of 'spore' formation.

"5. The methodology of luminescent microscopy (fixed smears in a humid chamber) makes it possible to study the morphological structure of the ornithosis virus at different stages of development in animal organs, in chick embryos, and in tissue cultures, and also to measure the virus particles."

Miscellaneous

101. New Czechoslovak Department for Tropical Diseases

"Against Tropical Diseases" (unsigned article); Prague, Obrana Lidu, 31 Oct 59, p 2

The State Faculty Hospital in Prague is planning to establish a new department before the end of 1959. The new department will bear the official title "First Consulting Office Against Tropical Diseases," and will have a large out-patient clinic as well as an experimental laboratory.

In addition to current consultations on tropical diseases, the new department will be the central clearing house for all yellow fever inoculations to be administered to out-bound Czechoslovak travelers, since the [illegible] serum cannot be transported successfully. Furthermore, the department will maintain a central card file on persons treated, inoculated, vaccinated, etc.

The need for the department, according to the source, was demonstrated by the presence, in Czechoslovakia, of many foreign (including Asiatic) visitors, and by increased travel activity of Czechoslovak specialists to the Far East. The article mentions that many of the Asiatic vicitors appear to be suffering recurring attacks of latent maladies which, although modified by the different climate of Central Europe, nevertheless are beyond the scope of current European medical practice. The article also states that while Czechoslovakia did not have a malaria specialist (malariologist) until recently, this situation was remedied by having the Hygiene and Epidemiology Faculty dispatch a team of physicians to the tropics to establish hospitals and, in the course of their activities, gather valuable information on bacterial carriers.

102. International Contacts of the Hungarian Academy of Sciences Described

"The Status and Problems of the International Contacts of the Hungarian Academy of Sciences" by Academician Lajos Janossy Academy secretary; Budapest, Magyar Tudomany, Sep 59, pp 479-487

The presidium of the Hungarian Academy of Sciences recently discussed the status and problems of the international contacts of the academy.

Prior to 1958, the Hungarian Academy of Sciences had special scientific cooperation agreements with the Academy of Sciences USSR, the Academy of Agricultural Sciences USSR (and the Ministry of Agriculture), the Czechoslovak and the Slovak Academies of Sciences, the Czechoslovak Academy of

Agricultural Sciences (and the Ministry of Agriculture), the Polish Academy of Sciences, the German Academy of Sciences in Berlin, the German Academy of Agricultural Sciences in Berlin (and the Ministry of Agriculture), and the Academy of the Rumanian People's Republic.

In 1958, and partly in 1959, the number of special agreements was expanded by special scientific cooperation agreements with the Academia Sinica, Tirana State University, the Bulgarian Academy of Sciences, and the Academy of Medical Sciences USSR (and the Ministry of Health).

Scientific cooperation agreements will probably be signed in 1959 with the Korean Academy of Sciences, the Vietnamese Scientific Committee, and the Mongolian Council of Science and Higher Education.

The Hungarian Academy of Sciences participates in the solution of problems placed on it by the Technical-Scientific Agreements between CEMA (Council for Mutual Economic Assistance) states; here, however, by the very nature of these agreements, its role is hardly that of initiator.

The scientific cooperation agreement regulates in detail the framework for cooperation, the methods for exchanging experiences and documents, for reciprocal study trips, and for a mutual information service; and it guarantees to scientific workers on both sides study trips which do not involve use of foreign exchange. The work plan which is set up each year designates in weeks the time allowed for study trips which can be made to other countries. In 1959, these opportunities amounted to 800 weeks, as opposed to 645 weeks in 1958. In addition to opportunities given by the scientific cooperation agreements, the academy can also organize study trips in other ways; at its own expense, or the expense of the host party, and the traveler.

In the yearly budget of the academy there is a certain amount of capitalist and socialist foreign currency available for financing study trips. The presidium of the academy distributes the foreign currency among the scientific departments. In 1958, 79 persons visited socialist countries and 73 persons visited capitalist countries using academy foreign currency support.

In 1958, 227 Hungarian scientists and scientific workers participated in 122 international programs on behalf of the Hungarian Academy of Sciences. Of these 122 programs, 61 were in socialist countries and 61 were in capilist countries.

The following were outstanding either because of their scientific significance or because of the weight of our participation: the Moscow Conference on the Physics and the Physical chemistry of catalysis; the Leningrad Conference on Mechanical Properties of Solids Made of Nonferrous Metals; the Moscow Forensic Sciences Conference; the Moscow Plenary Session of the Special Committee for the International Geophysical Year; the International Slavonic Congress in Moscow; the Moscow Electroencephalographic

Colloquium; the Warsaw Botanical Conference; the UNESCO Session in Prague for the preparation of "The Scientific and Cultural History of Man"; the Prague Silicate Chemistry Congress; the Slovak Polarographic Conference; the International Janacek Conference in Prague; the Prague Economists Congress; the Berlin Conference on Nervous Regulation of Renal Function; the Max Planck Memorial Celebration in Berlin; the Freiberg Miners Days; and the 400th anniversary of the Friedrich Schiller University in Jena.

The programs in capitalist countries included: the Economists Conference in Istanbul; the Congress of the International Anticancer Union in London; the International Microbiological Congress in Stockholm; the International Urological Congress in Stockholm; the Mathematics Congress in Edinburgh; the International Microchemistry Congress in Birmingham; the Vienna Biochemistry Congress; and the 12th International Philosophy Congress.

Considering their political significance, we must make special mention of the Kitzbuehl Atom Conference where an important meeting between socialist and capitalist atom scientists occurred, and the International Conference in Paris on large electric power nets and the Montreal World Power Conference where delegates of the academy supported the membership of China.

Special mention, from both a scientific and political viewpoint, should be made of the general meeting of UNESCO held in Paris in November-December 1958. Of no less importance is the membership of the Hungarian academy in various international scientific organizations. The Hungarian Academy of Sciences, its institutions, or its academicians personally have membership in about 100 international scientific organizations.

In 1958, the academy held nine international scientific programs and scientists from friendly countries also participated in the academy meeting in October 1958. A total of 94 foreign scientists participated in these programs. In 1959, there will be 22 such scientific programs. There were 50 foreign guests for the First Hungarian Musicology Congress and 25 for the Histology Symposium. Many foreign participants came to the Geochemistry conference, the Forestry Conference, and the Microbiology Congress.

In 1958, such distinguished scientists as D. Blohintsev, Soviet Academician and director of the Dubna United Nuclear Research Institute; H. S Koshtoyants, Soviet biology professor; C. V. Raman, Lenin Prize and Nobel Prize winning Indian physicist; W. Domesnek, American physician; and J. Roger, French geologist, came to the Hungarian Academy.

In many respects the study trips and the attendance of delegates at international scientific programs are not sufficiently organized or coordinated. This shows up in the following ways: there are no long-range scientific plans (on the basis of which priorities could be assigned to such trips); such trips are not coordinated among various (Hungarian) agencies; and there are insufficient funds.

In 1959, all the work plans of the bilateral agreements were given concrete form; in 1958, this was true only with respect to the Soviet Union and China. It would be expedient to regulate all Hungarian contacts in a many-sided and uniform way. Contacts between scientists of socialist countries should be made more extensive in some areas; for example, in the humanities common journals could even be published.

According to the present system, those who go on study trips, attend conferences, etc. give a report on their work after they return. One copy of this report is sent to that scientific department of the academy which is working with the subject problem; a second copy is sent to the Ministry of Foreign Affairs; and a third copy remains in the Department of International Contacts (of the Academy) where organizational steps are taken, if necessary. A resolution of the presidium now obliges the leading organs of the academy, primarily the department leaders, to deal much more fundamentally with evaluating these reports and with spreading the experiences contained therein. In the future, the presidium will include on its agenda, once or twice a year, an evaluation of the international exchanges of each scientific department.

Young scientific workers should be encouraged to make foreign contacts. But a shortage of foreign currency and the foreign language weakness of the young scientific generation makes this difficult.

Many difficulties are caused by the fact that the individual scientific departments, institutes, or scientists do not inform the Department of International Contacts about correspondence with foreign counterparts and they sometimes undertake obligations for which there are neither funds nor time. Difficulties are also caused by the fact that the scientific departments are late in submitting projects for international cooperation agreements.

103. Production of Titanium by Electrolysis

"Concerning An Electrolytic Method of Obtaining Titanium From the Dioxide in Melts of the System K_2TiF_6-NaCl, "by F. M. Kolomitskiy and V. D. Ponomarev, Kazakh Mining and Metallurgical Institute, Chair of Metallurgy of Light and Rare Metals; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Tsvetnaya Metallurgiya, No 5, 1959, pp 106-112

Preliminary experiments on the electrolysis of a eutectic mixture of 64% K_2TiF_6 and 36% NaCl with additions of TiO_2 are described which indicated the practical possibility of obtaining metallic titanium at low temperatures (650-700°C). Back electromotive force across a bath not containing oxides of titanium was 2.8-3 volts, whereas with the introduction of 2.5 to 5% TiO_2 it decreased to 1.7-1.9 volts. Deposits formed on the end of the cathode in the shape of a pear are made up of three distinct layers. The first (inside) layer consisted of a dense salt deposit, the middle of a loose mixture of crystals of metallic titanium and the electrolyte, and the outer of a dense dark grey deposit difficultly soluble in water or weak solutions of hydrochloric acid but easily dissolved in sulfuric acid. Content of metallic and total titanium in the middle layer from one test was 15.86% and 22.5% respectively, corresponding to a metal purity of 71%, and 15.22% and 16.4% in another test corresponding to a metal purity of 93-98.1%. Further testing and development of the method are considered warranted.

104. Diffusion Coating in Chloride Atmosphere

"Diffusion Coating of Steel With Metals From a Gaseous Medium During Heating by High-Frequency Currents," by Prof Yu. V. Grdina, Doctor of Technical Sciences, and Engr L. T. Gordeyeva, Siberian Metallurgical Institute; Stalinsk, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Chernaya Metallurgiya, No 7, Jul 59, pp 97-100

Tests were conducted in diffusion coating of Armco iron, 0.64% carbon steel and special alloys with chromium, aluminum, molybdenum, tungsten, and silcon from chloride atmospheres. Atmospheres were generated by firing the respective metal powder (600-650°C for aluminum and 940-960°C for the others) in purified chlorine gas. Objects to be coated

were heated by the intermittent induction method while being bathed in the chloride atmosphere and then soaked for 8-30 sec (with intermittent heating) at a temperature of 1,000-1,100°C. Approximately 0.2 mm thick layers of Si, Cr, and Al were obtained in 8-10 sec, whereas, a deposit of the same thickness of W required 15 sec. No detailed studies were made of diffusion coating of Armco iron and steel as investigations were shifted to special alloys (no information given).

105. Grain Boundaries in Metals

"The Structure and Energy and Grain Boundary in Metals," by K. A. Osipov, Institute of Metallurgy imeni Baykov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 2, Sep 59, pp 284-287

The energy of grain boundaries in relation to the angle of disorientation was computed for metals with grain-centered cubic lattices. The results were plotted in curves and show good agreement with the theory by J. K. Mackenzie and N. F. Mott (Proc. Phys. Soc. A 63 [1950]).

[For additional information on Metallurgy see Chemistry, Electrochemistry and Industrial Chemistry.]

Nuclear Physics

106. Proton Extraction

"A Method of Proton Extraction From a Synchrocyclotron," by M. A. Gan'zhin [deceased], Joint Institute for Nuclear Research; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 22-24

A method of accelerated proton extraction, based on application of a braking target and a deflecting magnet (O. Piccioni and D. Clark, Rev. Scient, Instrum., 26, 232 [1955]; B. T. Wright, ibid. 25, 429 [1954]) is described. For improved parameters of the extracted beam, the application of a deflecting magnet with a heterogeneous field is suggested. A schematic of optimal conditions of extraction is presented.

107. Neutron Spectrometer

"Neutron Spectrometer With a 'Pulsed Beam' Cyclotron," by K. G. Ignat'yev, I. V. Kirpichnikov, and S. I. Sukhoruchkin; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 25-31

A 256-channel neutron selector is described. The neutron source consists of a cyclotron with vertical deviation of the deuteron orbit to an internal beryllium target. It permitted the obtaining of neutron pulses of high density of~0.1 microsec duration. The width of the channel of the selector could vary from 0.25 to 32 microsec. All time correlations in the pulse delay analyzer were supported by constants of high accuracy. At a distance from the neutron delayer to the detector of 15 m, the selector had a resolution of 0.024 microsec/m.

108. Energy Spectra From Amplitudes

"Conversion of Amplitude Distributions Into Energy Spectra," by Yu. A. Kazanskiy; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 32-36

The instrument spectrum of pulse amplitudes and the efficiency of a single crystal scintillation gamma-spectrometer with a CsI(Tl) crystal was studied. The obtained data permitted constructing a

numerical matrix with the help of which and by applying the method of consecutive subtractions, the amplitude pulse distributions were converted into energy spectra.

109. Electronic Model for Cosmic Ray Data

"Electronic Modeling Equipment for the Treatment of Data on Wide Atmospheric Showers of Cosmic Rays," by G. V. Bogoslovskiy and B. A. Khrenov, Scientific Research Institute of Nuclear Physics, Moscow State University; Moscow Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 37-40

An electronic modeling apparatus solving the problem of finding the most probable position of the axis of a wide atmospheric shower and the number of particles in the shower while recording the shower by a system of counters coupled in a hodoscope is described. The equipment models a mathematically accurate solution and gives the distribution of the probability from the coordinates of the axis of the shower in the observation plane and from the number of particles in the shower. The accuracy of the solution of the problem is analyzed.

110. Bubble Chamber

"Application of the Method of Second Differences for the Measurements of Multiple Scattering in a Propane Bubble Chamber," by I. I. Pershin, V. V. Barmin, V. P. Kanavets and B. V. Morozov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59 pp 44-49

A detailed description is presented of the use of the method of second differences for the measurement of the mass of particles and energy of electrons from multiple scattering in the previously described propane bubble chamber. (ibid. No 1, 39 [1957]). The values of the scattering constant for propane computed according to the theory by E. J. Williams (Phys. Rev. 58, 292 [1940]) and G. Molier (Z. Naturforsch., 2a, 133 [1947], 3a, 78 [1948]) and its experimental values determined by measurements of μ-mesons and positrons are presented. The specific conditions arising in measurements of multiple scattering in bubble chambers are described.

111. Convection Chamber

Convection Chamber--a New Device for Observation of Charged Particle Tracks," by V. K. Lyapidevskiy, Moscow, Engineering-Physics Institute; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 49-53

A convection chamber is described -- a device close to the diffusion chamber in its principle of operation. It differs from the latter in that the convection chamber has in its bottom plane a temperature difference reaching 80°C. Curves of temperature distribution, of the distribution of partial pressures and of saturation in the chamber volume are presented. Chambers for demonstration and for the measurement of small activities of solid, liquid and gaseous substances are described. Photographs of charged particle tracks in the chamber are shown.

112. Ionization Chamber

"The Degree of Super Compression in a Fast Operating Wilson Chamber," A. P. Andreyev, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 53-55

The expression of the minimum degree of adiabatic super compression required for complete evaporation of noncharged drops produced during the adiabatic expansion preceding compression, is derived. A numerical evaluation is carried out for a chamber operating with vapors of pure ethyl alcohol in air at a pressure of one atmosphere and in hydrogen at a pressure of 100 atmospheres.

113. Automatic Treatment of Photographs of Emulsion Chambers

"Equipment for Semiautomatic Photographic Processing of Large Emulsion Chambers," by D. M. Samoylovich, B. A. Smirnitskiy, S. A. Sukhov, V. D. Ryabov, and A. V. Rulev; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 58-62

The description of the technological process and the schematic of the equipment for a semiautomatic processing of layers of large emulsion chambers is given. The operating surface of the developing equipment is 2 m^2, and fixing is 10 m^2. The development of the chamber of 4-liter volume (500 layers 400 microns thick) may be accomplished in 2 days, if the layers are developed without underlining and 3 days if the layers are underlined. The fixing and washing of nonunderlined layers of the same size chamber take 45-50 hours, and underlined, 75-80 hours. Therefore the full processing of a 4-liter chamber may be accomplished in 4-6 days.

114. Bubble Chamber

"A Xenon Bubble Chamber," by Ye. V. Kuznetsov and I. Ya. Timoshin; Moscow, Priborȳ i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 40-44

A xenon bubble chamber having an operational volume of 20 x 11 x 10 cm^3 is described.

115. Small Ionization Chamber

"A Small Dimension Ionization Chamber With He-3 Under Pressure up To 4 Atmospheres," by A. I. Abramov; Moscow, Pribory i Tekhnika Eksperimenta, No 4. Jul/Aug 59, pp 56-57

The construction of a spherical ionization chamber is described. It is intended for spectrometric measurements on fast neutrons. The filling mixture contains 50% He-3 and 50% Ar under pressure up to 8 atmospheres. The energy resolution of the chamber is ± 30 kev on slow neutrons and ± 80 kev on neutrons of 600 kev energy.

116. Luminescent Dosimetric Control

"Equipment for Individual Luminescent Dosimetric Control ILK-3," by I. P. Belov, K. S. Kalugin, I. B. Keyrim-Markus, V. I. Nikiforov, and M. S. Poroshina; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 74-80

The construction and the electronic diagram of a new ILK apparatus is described. It permits measurements under ordinary illumination without overexposing the dosimeters. The equipment uses pulse illumination by infrared light and the integration of the photocurrent in a memory cell. Test results of some dosimetric characteristics of the ILK method are presented.

117. Operation of Fast Reactor

"Fast Reactor Pulsed Operation," by I. I. Bondarenko and Yu. Ya. Stavisskiy; Moscow, Atomnaya Energiya, Vol 7, No 5, Nov 59, pp 417-423

For many physical experiments carried out on nuclear reactors, the decisive value is not the mean power of the reactor for a long period of time, but its power during the short period necessary for the experiment. In these cases, the most convenient operation of the reactor is pulse

operation, i.e., operation during which the reactor power increases manifold during a short time period. The advantages of pulse operation may be seen best in a fast reactor, inasmuch as the lifetime of neutrons in it is minimal, in comparison with other types of reactors. The expressions for the pulse durations are derived for a fast reactor, as well as expressions describing the relation of power pulses to time. The possible characteristics of the pulsed fast reactor convenient for investigations in nuclear physics are described.

118. Stability of Heat Exchange in a Reactor

"Stability of the Heat Output From a Pulsed Reactor," by T. N. Zubarev; Moscow, Atomnaya Energiya, Vol 7, No 5, Nov 59, pp 421-423

Conditions of stability of heat output in a pulsed reactor are analyzed and formulas for computing the heat exchange for linear and cosinoidal laws of reactivity variation during the neutron surge are derived.

119. Fissile Nuclides

"Properties of the Resonance Levels of Fissile Nuclides," by I. V. Kirpichnikov and S. I. Sukhoruchkin; Moscow, Atomnaya Energiya, Vol 7, No 5, Nov 59, pp 429-444

The computation and the design of reactors require the knowledge of cross sections of neutron interaction with various materials within a wide range of energy. The processes of interaction of neutrons with nuclei (radiative capture, fission, scattering) occur, according to up-to-date assumptions, with the formation of an intermediate nucleus, and have a sharply expressed resonance character: at a certain neutron energy the value of interaction rises sharply. The position and the magnitude of resonance levels cannot be theoretically predicted, and therefore, direct measurements of cross sections are the unique source of the required information.

The article is a review of works carried out between the first and second conference on atoms for peace in Geneva in 1955 and 1958 and concerning the study of properties of resonance of fissile nuclei. On the basis of available data, various methods describing the interaction of neutrons with fissile nuclei are analyzed. Experimental data are not yet fully explained; however some characteristic facts of the fission process already have been observed. Some improvements in methods applied to the measurement of parameters of resonance levels are described and the obtained results are analyzed.

120. Half-Life of Ra-226

"Half-Life of Radium," by G. V. Gorshkov, Z. G. Gritchenko, T. A. Il'inskaya, B. S. Kuznetsov, and N. S. Shimanskaya; Moscow, Atomnaya Energiya, Vol 7, No 5, Nov 59, pp 445-455

The wide application of Ra-226 as a standard of radioactivity as well as in therapy, industry, and preparation of neutron sources requires the determination of the half-life of this isotope. Data from literature are reported and an originial experimental work on accurate determination of this value by a calorimetric method is presented.

The measurements of the heat effect of three equivalent radium preparations yielded for the specific activity of Ra-226 the value $(3.71 \pm 0.02) \cdot 10^{10}$ decays/sec per gram of Ra-226 which corresponds to a value of half-life 1577 ± 9 years. Calorimetric measurements were carried out on a double static calorimeter with response to $\sim 2 \cdot 10^{-4}$ watt. The content of radium in the preparations was determined by direct weighing of the salt $RaBr_2$, the purity of which was tested spectroscopically.

Solid State Physics

121. Industrial Magnetization

"Industrial Magnetization of Ferromagnetics," by L. V. Kirenskiy, M. K. Savchenko, and I. F. Degtyarev, Institute of Physics, Sibirian Branch, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 2, Sep 59, pp 288-290

The change in the domain structure consisting in boundary shifts during magnetization in various directions was revealed by magneto-optical means. The figures show parallel light and dark streaks, corresponding to domains magnetized along and against the light axis (001) located horizontally. More complex pictures appear during magnetization at 90° to the light axis. It is inferred that magnetization on account of reconstruction of the domain structure is the stronger, the closer the angle between the direction of the light axis and the magnetizing field approaches 90°.

[For information on gas dynamics, see Chemistry, Fuels and Propellants.]

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